DEPARTMENT OF AGRICULTURE, CEYLON.

BULLETIN No. 70

GUIDE TO THE CENTRAL EXPERIMENT STATION, PERADENIYA.

BY

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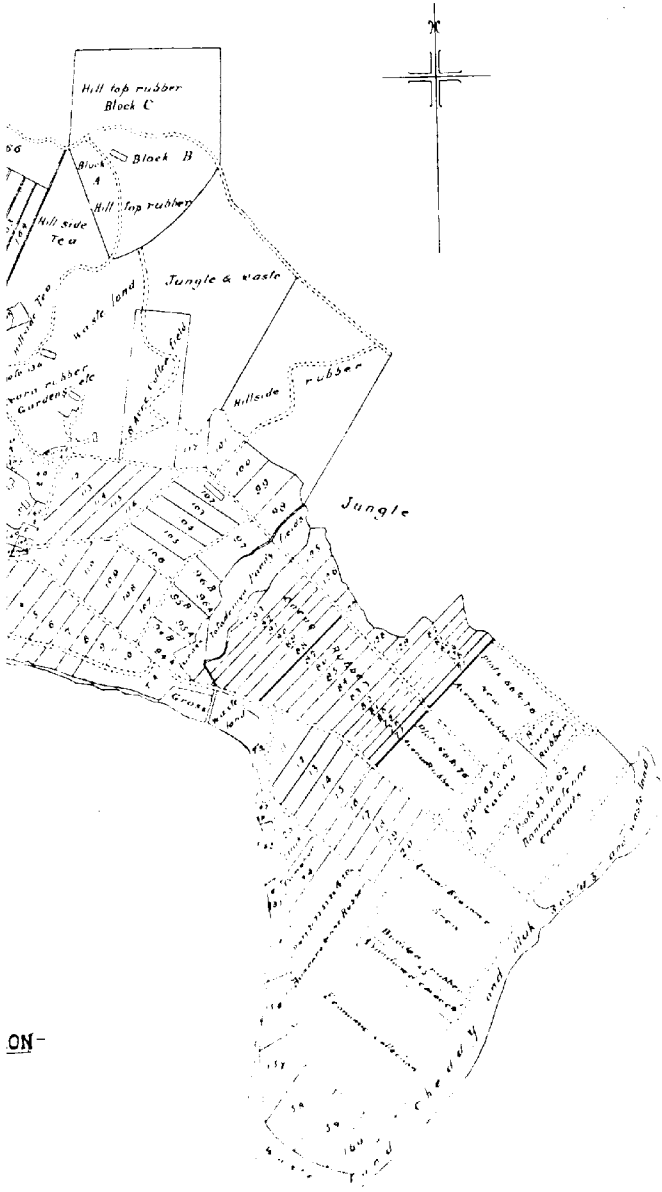
Hill top rubber
Block C
Block B
Block A
Hill top rubber
Hill side Tea
Jungle & waste
waste land
Hillside rubber
Jungle
Grass
ON-

GUIDE TO THE CENTRAL EXPERIMENT STATION, PERADENIYA.

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6(7)24–2,000

DEPARTMENT OF AGRICULTURE, CEYLON.

BULLETIN No. 70.

HISTORY AND DESCRIPTION.

THE Central Experiment Station, also known as Gangaroowa Experiment Station from the name of the village which it adjoins, is situated on the left bank of the Mahaweli-ganga, opposite the Royal Botanic Gardens, Peradeniya. It can be approached either through the Gardens by crossing the river by a ferry, or by a road which branches off from the Colombo-Kandy road in the village of Iriyagama. Emerson Tennent, speaking of the introduction of coffee during Sir Edward Barnes' Governorship, says : " Sir Edward formed the first Upland Plantation about 1825,[1] on his own estate at Gangaroowa, adjoining the Gardens of Peradeniya." The land subsequently passed into other hands and was taken over by Government early in 1902. The greater part of the cultivated land was at that time under cacao, about which the following remarks by Dr. R. H. Lock are on record :—

> " A bird's-eye view of the estate at this period would have shown an almost continuous forest of *Albizzia moluccana* trees. When these had been cut down—and this was done as rapidly as possible—a similarly continuous layer of coconut palms would have come into view, and it was after the removal of a large proportion of these as well that any sunlight was able to struggle through as far as the cacao."

Mr. Herbert Wright, in the First Annual Report of the Controller, dated February, 1903, states : " The condition of the cultivated area, excepting the grass land, is bad ; it is densely overcrowded, and the main product—cacao—is in a weak condition."

He adds further :—

> " Coconuts, Arecanuts, Crotons, Pepper, Annatto, Coffee, Sappan, Ceara and Castilloa Rubber, Cardamoms, Castor Oil Plants, Citronella, Fodders, Nutmegs, Oranges, Limes, and very many useful timber trees are now growing on the station."

[1] Gangaroowa was opened in 1826, and was the second estate to be established up-country.

6(7)24-2,000

In 1909 it appears that, omitting 33 acres of grass land, 178 acres were under cultivation, and of this 90 acres were under cacao. The acreages under various crops at the present day are approximately as follows :—

	Acres.
Para rubber	54
Castilloa rubber	5
Cacao	39½
Coconut	27
Tea	21½
Coffee	9½
Cultivated fodder grasses	11½
Paddy	7
Fruit	4
Economic collection	12
Annual economic area	6
Camphor	1
Miscellaneous plots	5
Economic Botanist's vegetable plots ..	2
Gardens	7
Total cultivated ..	212
Buildings, lines, roads, cheddy, waste land, and small patches of jungle ..	55
Main jungle	280
Total ..	547

The mean elevation is about 1,550 feet.

The climate is moist and equable, the mean annual temperature being about 76° F. The mean average rainfall on the Experiment Station for 14 years between 1904 and 1923 was as follows :—

	Inches.	Number of Wet Days.
January ..	5·18 ..	10
February ..	2·22 ..	4
March ..	4·71 ..	8
April ..	5·57 ..	12
May ..	6·02 ..	11
June ..	11·41 ..	20
July ..	8·50 ..	20
August ..	6·25 ..	17
September ..	7·41 ..	14
October ..	12·14 ..	18
November ..	11·42 ..	18
December ..	7·72 ..	12
Total ..	88·55	164

CATALOGUE OF PLOTS.

Number of Plot.	Section in which referred to.	Number of Plot.	Section in which referred to.
1 to 10	3	140 D	4
11 to 15	2	140 E, F, G, H, I, J, K, L, M, N, O, P	4
16 to 20	13	141 to 150	1
21 to 23	2	151 to 154	2
24 and 25	13	155	1
26 and 27	2	156 to 162	7
28 to 37	10	163 and 164	1
38 to 47	9	165	2
48 to 51	9 and 7	166	1
53 to 62 (Bandaratenne coconuts)	5	Tundu A	3
63 to 67	2 and 3	Tundu B	3
68 to 87	2	Tundu D	2
88 to 101	3	Hilltop rubber	2
103 to 106	5	Hillside rubber	2
107 to 116	3	Hillside tea	1
117	3	Half-acre tea	1
119	3	Totadeniya paddy fields	6
120	3	Panchikawatte paddy fields	6
121 to 124	5	Show plots	8
125 to 129	2	Annual economic area	10
134	3	Economic collection	9
136 and 137	4	Six-acre coffee field	4
140 A	2	Fruit plots	11
140 B	3		
140 C	13		

SECTION 1.

TEA.

The present tea land, though (with the exception of plot 155) all in adjacent blocks, is most easily considered in the following sections :—

(1) Eleven acres of old tea now under manurial experiments.
(2) Plots 163 and 164.
(3) Plot 166.
(4) Hillside tea.
(5) Half-acre tea plot.

(1) Old Tea under Manurial Experiment.

This area comprises plots 141 to 150 inclusive and plot 155. Occasional reference will also be made to plots 151 to 153 (now under rubber), which were planted concurrently and then formed a continuous block with plot 155. The land was under secondary jungle, cacao, and other products, and was cleared and planted in tea in 1903.

Plots 141 to 143 were planted 4 feet by 4 feet with Singlo indigenous, a pale-leaved variety less vigorous than the Manipuri jât. The plots were apparently supplied later with seed from other sources, but these were subsequently removed, and the plots supplied with the purer variety from Coolbawn estate. A considerable mixture of jâts is, however, now apparent in these plots.

Plots 144, 145, and 155 were planted with Assam hybrid tea from Horagalla estate.

Plots 146 to 150 were planted with dark leaf Manipuri indigenous from Kotiyagala and Norwood. The growth of this tea has been uniform and vigorous. In all the plots the lower half is more or less level, while the upper portion rises fairly steeply. Plot 155 is the most level and sheltered plot.

The soil of the plots was analysed at the commencement of the experiment; details of these analyses are found in Royal Botanic Gardens Circulars, Vol. V., No. 1.

The soil was described as physically more or less uniform. Chemically there was more variation. The organic matter generally was low; magnesia and potash were unusually plentiful; the quantity of lime and phosphoric acid was above the average in some plots, but normal in plots 141, 147, 148, 149, 150, and 155. The average percentages of the chief constituents were—

	Per Cent.
Nitrogen	0·113
Lime	0·157
Potash	0·297
Phosphoric acid	0·073

All soils had a distinctly acid reaction, characteristic of both up-country and low-country tea soils.

Most of the plots have a tendency to harden during drought.

Green Manuring.

In 1904 green manuring experiments were commenced in five plots, 148 to 152 inclusive. The planting was as follows:—

Plot 148.—*Crotalaria striata* broadcasted in alternate lines at the rate of 30 lb. seed per acre.

Plot 149.—Dadaps planted 16 feet by 16 feet, or 170 trees to the acre.

Plot 150.—*Albizzia moluccana*, 25 feet by 25 feet, or 69 trees to the acre.

Plot 151.—*Arachis hypogea.*

Plot 152.—*Vigna Catiang.*

The latter two plants were not very successful. The Crotalaria was cut four times in all up to September, 1905, and yielded 20,827 lb. of fresh green material which was mulched in alternate rows. No further treatment was then given to this plot.

The Dadaps in plot 149 commenced to yield leafy material in five months from planting. At the end of 1908 they were cut back to 5 feet. The total yield up to the end of 1909 (five years' lopping) was 73,978 lb. of green material per acre, or 14,795 lb. per acre per annum. This quantity was estimated to contain 628 lb. of nitrogen. The cost of pruning was estimated to have been Rs. 16·23 per annum. The healthy appearance and good yield of the tea under these Dadaps has been commented on throughout. Further records of weights of loppings are available for the following years :—

Year.			Per Acre. lb.
1916	.. 2 loppings	.. ..	8,141
1917	.. 2 do.	.. ..	7,920
1920	.. 2 do.	.. ..	12,980
1921	.. 2 do.	.. ..	11,798
1922	.. 3 do.	.. ..	20,220

The total weight of loppings from June, 1915, to August, 1922, excluding the years 1918 and 1919, is 62,217 lb., or an average of 12,214 lb. per acre for the five years.

In July, 1920, fresh Dadap cuttings were planted in plot 149 with the idea of replacing the old trees. The old trees were cut out in August, 1922, after the third and final lopping in that year. The weights of loppings from the new stumps before the removal of the old trees are not included in the figures given above.

The Albizzias in plot 150 were first lopped in 1905. In 1918 it is recorded that after 12 years' lopping 51,228 lb. or an average of 4,269 lb. per acre per year were obtained. This record compares unfavourably with that of the Dadap plot 149; but there were a large number of vacancies towards the end of the period, for in January, 1917, it is recorded that fifteen Albizzia trees were dead. In June, 1921, the old trees were cut out, and the number of vacancies at this time greatly exceeded fifteen.

In 1908 the trees were cut down to 5 or 6 feet. In 1910 the old trees were considered to be too large, and supplies were interplanted to take their place. Great difficulty appears to have been experienced in establishing new Albizzias; in August, 1920, ten years later, supplies were still being planted

to replace the old trees, and in January, 1921, there were no young trees growing at all. It was decided then to cut out the old trees and to plant new trees again after an interval of two years. After digging holes and manuring with cattle manure, Albizzia seed at stake was planted in September, 1922; most of this seed failed. Subsequently, planting was continued with basket and nursery plants. In January, 1924, many of the earliest planted trees were about 10 feet high, but the growth is patchy, and vacancies still exist. The appearance of the tea throughout has not been equal to that under Dadaps. The yields of these plots can be followed in the tables of tea yields which follow.

After four years' growth of the green manures, the increase in the organic matter in plots 148, 149, and 150 was found to be as follows :—

	Plot 148. Crotalaria.	Plot 149. Dadap.	Plot 150. Albizzia.
	Per Cent.	Per Cent.	Per Cent.
Top 18 inches of soil	1·50	1·60	2·20
Top 2 inches of soil	2·40	1·60	3·40

In 1908 Crotalaria was again tried in plot 143 with the addition of 200 lb. of basic slag and 80 lb. of sulphate of potash; and in plot 147, without the addition of these manures, 30 lb. seed per acre was sown in alternate rows.

In plot 143 (Assam hybrid) the growth was vigorous, and in four months overtopped the tea. The stems were twice as thick as those in plot 147, but the more woody ones died out during dry weather after lopping. The crop was cut twice again in that year, and yielded in all 15,228 lb. in eleven months containing about 131 lb. of nitrogen worth Rs. 68. The total cost of the labour involved was Rs. 8·46.

In plot 147 (without manures) the growth was only medium. The total yield was 8,739 lb. in eleven months containing 75 lb. of nitrogen worth Rs. 39.

A further 8 lb. of seed was sown in 1909; instead of being cut, this crop was bent down. The resulting growth was not good, and the method was not recommended. The crop then gradually died out.

In 1909 plot 142 was sown in alternate lines with *Indigofera anil* at the rate of 10 lb. per acre. It appears to have yielded 12,828 lb. of green material in 1909 and 1910. The plants stood lopping better than Crotalaria, and the tea improved under the treatment. The Indigofera was uprooted in 1910.

Plot 141 appears to have been mulched during its early days with cheddy and green jungle material.

In plot 151 an unsuccessful attempt was made to smother Kora grass (*Cyperus rotundus*) with Crotalaria.

In 1911 it was recorded that *Crotalaria striata* did not seem to be growing as well as formerly, and *Tephrosia candida* could in many instances take its place with advantage.

Plot 144 was planted up with Dadaps, 16 feet by 18 feet, in January, 1912, to ascertain whether the Assam hybrid tea would respond to green manuring as the Manipuri indigenous had done ; this has certainly been the case.

The following yields of green material are on record for this plot :—

Year.		Per Acre. lb.
1916	2 loppings	8,570
1917	3 do.	9,732
1920	2 do.	11,477
1921	2 do.	9,954
1922	4 do.	23,170
1923	3 do.	19,040

The average per acre per annum was 15,322 lb. The increased weight since 1921 is mainly due to the more regular lopping the trees have received. In June, 1921, fresh Dadap stumps were planted with a view to replacing the old trees.

Manuring and Cultivation.

In March, 1908, and again in September, plots 141 and 142 received 25 lb. of sulphate of ammonia, 25 lb. of nitrate of soda, and 50 lb. ordinary superphosphate. No other plots received artificials in that year.

In 1909 just before the second pruning all the plots except 143 were deeply forked. After pruning, 200 lb. of basic slag and 60 lb. sulphate of potash were spread up these rows and the prunings heaped on the top. In plot 143 the prunings were buried with a similar mixture in holes 2 feet by 2 feet between every four bushes.

This treatment of prunings appears to have been continued up to 1913, after which year the following procedure was adopted :—

The prunings were heaped in alternate lines without forking ; when the leaves had fallen the branches were removed to the other lines, the basic slag and sulphate of potash spread on the leaves, and the whole forked in with mamoty forks. From 1917 onwards (from the commencement of the manurial experiments) the quantity of basic slag was reduced to 100 lb. per acre. From 1921 vertical forking with digging forks was substituted for the previous shallow mamoty forking. In the same year, for one year only, on account of the prevalence of Shot-hole Borer, instead of allowing the leaves to

drop, the leaves and small twigs were lopped off directly after pruning, and the woody portions of the prunings burnt.

In March, 1908, plot 155 was manured with cattle manure at the rate of 30 tons per acre. In 1910 a further application was given to the poorer bushes on the steep portion of the plot. The plot then received no manure till 1921, when a further application of 20 tons of cattle manure was given. The maintenance of the yield and appearance of the bushes has been remarkable.

In September, 1916, in plots 145 and 149, 1,000 lb. per acre of well-burned lime was broadcasted in every row and lightly forked in. In plots 146, 148, and 150, 500 lb. per acre was similarly applied. In July, 1917, the manurial experiments, which are still in progress, were commenced. Plots 141, 142, 143, 146, 147, and 148 were each divided up into half-acre plots, named A and B, for separate treatment. The general idea was the omission in turn of each of the chief manurial ingredients. The manures are forked into alternate rows by deep vertical forking. In the first application after pruning, the manures are applied to the rows which did not last receive the pruning mixture of basic slag and sulphate of potash; in the following year they are applied to the alternate rows. The manures applied will be found in Table B, which gives the yield of the plots from 1917 to 1923. It will be seen that the treatment given to the Singlo jât plots, 141–143, is duplicated in the Manipuri indigenous plots. Of the two Assam hybrid plots, 144 is under Dadaps, while 145, the control plot, receives no manure except the pruning mixture. The number of bushes in each plot varies considerably. A census of bushes in bearing is taken annually, and the reports and bulletins published periodically give, in most cases, the yields of made tea calculated to a total of 2,722 bushes to the acre.

Table C gives the actual number of bushes in bearing for the years in which this information is available. Tables A and B give the yields of made tea calculated from the actual quantities of green leaf harvested. Full details of these experiments and deductions made from time to time can be found in the circulars and bulletins published on the subject.

The following points attract notice:—

(1) The superiority of the Manipuri indigenous jât bushes over the Singlo or Assam hybrid.

(2) The satisfactory yields and health of the bushes in the two Dadap plots without the aid of any artificial manures except the pruning mixture.

(3) The inferior vitality and power of disease resistance of the bushes in the control plot.

Pruning.

The first pruning, which was a light one, was given in January, 1908. The Singlo plots were then pruned again eighteen months later, the Assam hybrid twenty months later, and the Manipuri indigenous twenty-one months later. Subsequently, pruning was done every two years, the Singlo and Assam hybrid jâts being pruned in June, and the Manipuri indigenous in December or early January. At the latter pruning one branch was left unpruned to help the bushes during the succeeding dry weather. After the inauguration of the manurial experiments it was decided that all the tea should be pruned at the same time. Consequently in March, 1919, the bushes in plots 141 to 143 were slashed across, and the whole area pruned together in October of that year. Two-yearly pruning of the whole area in October or November is still continued.

In 1921 a severe cutting down was given, as the bushes had suffered severely from branch canker and attacks of termites. The results were not satisfactory. In addition to the inevitable loss of crop many casualties occurred ; this will be mentioned again in referring to pests and diseases. At the last pruning in 1923 one branch was left unpruned in all the B plots of the plots divided in two half-acre plots. The recovery of the bushes in these B plots in the case of the Manipuri jât appeared rather superior to those in the A plots. In one case the superiority might reasonably be attributed to the difference in manurial treatment. In the Singlo plots no difference could be seen.

Plucking.

Plucking first commenced in October, 1906, *i.e.*, three years and two months after planting. The early plucking was apparently not good, and a good deal of close hard plucking was done in 1907 and 1908. From October, 1908, onwards more careful whole leaf plucking was commenced, and resulted in a marked improvement to the bushes. Careful whole leaf plucking once a week, except for one or two rounds to the fish leaf before pruning in certain years, has been continued until the present day. There can be no doubt that this weekly plucking has been, to a large extent, responsible for the high yields which have been obtained from a not very high class of tea.

Pests and Diseases.

It has been remarked throughout that the health and vigour of the Singlo plots has never been equal to that of the Manipuri plots, and fairly numerous casualties appear to have been occurred in the former. The earlier publications,

however, do not make mention of any widespread specific disease or pest. The Kora weed (*Cyperus rotundus*) has given a good deal of trouble, particularly in plot 145. It has been held that the weed has killed out tea bushes in this plot, but perfectly healthy tea may be seen surrounded by a thick growth of Kora in other plots.

After the severe pruning given in 1921, which was followed by dry weather during the period of recovery, a considerable number of bushes died. The final number of casualties was as follows :—

Plot 141	..	59 Singlo	
Do. 142	..	56 do.	
Do. 143	..	69 do.	
Do. 141	..	33 Assam hybrid—Dadaps	
Do. 145	..	115 do.	Control plot
Do. 146	..	30 Manipuri indigenous	
Do. 147	..	28 do.	
Do. 148	..	32 do.	
Do. 149	..	12 do.	Dadap plot
Do. 150	..	33 do.	
Do. 155	..	33 do.	

The plots were examined at this time by officers of the Mycological division, and the following diseases were identified :—Diplodia, *Fomes lignosus*, *Sphærostilbe repens*, the last only in swampy ground. No marked correlation could be traced between the number of casualties or the presence of disease and the manurial mixture applied ; though in the Singlo and Assam hybrid plots it appeared in one case that casualties were fewer where a complete mixture was given than where a mixture containing nitrogen and potash only was applied, and in another case that less bushes died where nitrogen and phosphoric acid were applied than where nitrogen only was given. The points that most attracted attention were—

(1) The superior vitality of the Manipuri indigenous jât.
(2) The superiority of the Dadap plots.
(3) The inferior vitality of the control plot.

Branch canker has been prevalent in the old tea plots in the past, and the damage done by this disease, followed by attacks of termites, became very apparent during the heavy pruning in 1921. The disease appeared worse in the Assam hybrid plots. Red rust has also appeared to some extent in many of the plots, particularly in badly drained portions : the plots under Dadap shade were least affected.

Shot-hole Borer has been prevalent for some years. Experiments with various remedial measures, including the application of paint mixtures, have been carried on from time

to time, and these experiments are described in the publications dealing with this pest. The pest was very prevalent in 1921, and after pruning in that year all the woody portion of the prunings were burnt. Owing to showery weather, however, it was found very difficult to burn the prunings early enough to anticipate the possible emergence of the insects. At the time of pruning in 1923 the incidence of the pest was markedly less, and no special measures were adopted with regard to disposal of prunings. Previous to this pruning, a census of bushes attacked by Shot-hole Borer revealed the following figures :—

Plot.	Manures.	Bushes attacked.	Total.
141 A	286 lb. Groundnut cake + 50 lb. Potassium sulphate	123	198
141 B	286 lb. Groundnut cake	75	
142 A	286 lb. Groundnut cake + 111 lb. Superphosphate	56	109
142 B	286 lb. Groundnut cake	53	
143 A	111 lb. Superphosphate + 50 lb. Potassium sulphate	25	61
143 B	286 lb. Groundnut cake + 111 lb. Superphosphate + 50 lb. Potassium sulphate	36	
144	Dadap	47	47
145	Control	175	175
146 A	Same as plot 141 A	63	101
146 B	Same as plot 141 B	38	
147 A	Same as plot 142 A	35	63
147 B	Same as plot 142 B	28	
148 A	Same as plot 143 A	39	87
148 B	Same as plot 143 B	48	
149	Dadap	60	60
150	Albizzia (Albizzia cut out in January, 1921)	263	263
155 A	Cattle manure	53	103
155 B	Cattle manure	50	

The Dadap plots showed the lowest incidence of attack.

SUPPLYING.

Supplying vacancies in the old plots has been periodically carried out with varying success. Following the casualties after the severe pruning in 1921, the problem was tackled afresh. Seed was obtained and new nurseries established. In June, 1923, the Singlo plots were supplied with basket plants, most of which are doing fairly well. The Manipuri indigenous plots were supplied with basket plants in the north-east monsoon of 1923, and healthy nursery plants are available for further supplying in 1924. Two bushes have been allowed to grow up to form seed bearers in one plot of each jât.

(2) Plots 163 and 164.

These plots were originally numbered 151 and 152, but as plots of rubber (originally tea) with these numbers already existed, the plots were re-numbered 163 and 164 in 1921. These plots were under secondary jungle which was felled in 1917. In 1918 the land was planted with stumps of Huldubari Dooars tea presented by Mr. G. H. Masefield and raised from seed on Houpe estate, Ratnapura. In 1919 plot 163 was planted 16 feet by 16 feet with Dadap cuttings and plot 164 with cuttings of *Gliricidia maculata*. Both plots were also interplanted with sword beans. In May, 1919, some vacancies were supplied with Huldubari Dooars, and the remainder with dark leaf Manipuri stumps from Kotiyagala and High Forest estates, since sufficient supplies of the original variety were not available. The bushes were cut down in 1921, and the first regular pruning given in 1923. At this time it was found that Shot-hole Borer appeared more prevalent in plot 164 under Gliricidia than in the plot under Dadaps, and the Gliricidia itself was attacked by the pest.

The Dadaps in plot 163 are lopped at the same time as those in plots 144 and 149. Owing to the large demand for Gliricidia cuttings, these trees are not lopped till the cuttings are mature and the season for supplying them arrives.

In 1922 contour hedges of *Indigofera arrecta* about 6 feet apart were planted in these plots. The hedges have done good service, but after three loppings are now (January, 1924) beginning to die out. The growth of the tea in these two plots has not been particularly satisfactory as the soil is generally poor.

(3) Plot 166.

A belt of jungle immediately above the existing tea plots was cleared in 1917 and planted with Goipani hybrid tea in October, 1918. Most of this tea died out in the drought of 1919, in which year the plot was supplied with dark leaf Manipuri stumps. In the same year the plot was planted up part with Dadap and part with Gliricidia stumps, 16 feet by 16 feet. In 1920 the whole plot was forked and supplied with dark leaf Manipuri stumps. In 1921 vacancies were again supplied, cattle manure having been first applied to every hole.

In 1922 vacancies were supplied and contour hedges of *Indigofera arrecta* were sown 6 feet apart. The Indigofera made excellent growth in this plot.

Only a small proportion of tea is yet in bearing, and many vacancies still exist. Except for the applications of cattle manure to young supplies in 1921 the plot has not been manured.

(4) The Hillside Tea.

The jungle intervening between the old tea plots and the hill top rubber was cleared in 1918, and the land planted in December of that year with seed at stake of dark leaf Manipuri from Kotiyagala. In June, 1919, the area was divided into three blocks running parallel with the old tea plots; the centre block was planted up with cuttings of Gliricidia and the two outer blocks with Dadaps, all 16 feet by 16 feet. The soil in this area is extremely poor, and the greatest difficulty has been experienced in establishing the tea. 16,000 vacancies were supplied in 1920; in 1921 a further large number were supplied, cattle manure being first applied to every hole. Very unfavourable weather followed this planting. 8,000 vacancies were supplied in 1922 with stumps from Norwood estate.

In 1922 contour hedges of *Indigofera suffruticosa* and *I. arrecta* were sown 6 feet apart. After three loppings these hedges were dying out in January, 1924.

The original drains of this land were considered deficient both in size and number; in December, 1920, all the existing drains were re-dug to a depth and width of 18 inches, and in 1923 six new drains were put in.

In 1921 a considerable number of jungle stumps were dug up and removed or burnt. Only a portion of the bushes are in bearing yet, and though the situation is improving vacancies still remain to be supplied. It is proposed to replace the present contour hedges with similar hedges of *Clitoria cajanifolia* as soon as weather conditions allow and seed is sufficient. Beyond the application of cattle manure to young supplies in 1920, the land has not been manured.

(5) Half-Acre Tea Plot.

This is the surviving portion of a block of $2\frac{1}{2}$ acres planted in May, 1919, of which 2 acres were cut out again in 1920 to form paddy fields. The original planting was with light leaf Manipuri stumps from Kotiyagala estate. Vacancies were supplied annually; in 1921 the supplies were drawn from High Forest estate, Maturata. Part of the plot is shaded with Dadap and part with Gliricidia. Comparative figures recorded during 1922 and 1923 of the green material obtained from the loppings of these Dadap and Gliricidia trees gave the following results :—

	Gliricidia. lb.	Dadap. lb.
Weight of green loppings per tree per year	141	90

	Per Cent.	Per Cent.
Percentage of organic matter in loppings (from Government Agricultural Chemist's analyses) ..	20·2	10·4
	Tons.	Tons.
Weight of green loppings per acre planted 16 feet by 16 feet ..	13·6	7·2
Weight of organic matter per acre ..	2·7	·7

This question will be referred to again in the section on Green Manures. Originally this plot had no drains. A series of drains at right angles to the road were dug in 1923. The plot has never had a very healthy appearance, and only a proportion of the bushes are in plucking.

In 1921 a fairly heavy application of cattle manure was forked into alternate rows.

General.

The systems of plucking and pruning described with regard to the old plots are in force in all the tea plots.

Weeding.

The growth of weeds on all the tea land is vigorous, and though the situation has, with regular weeding, improved considerably in recent years, it has been considered advisable up to the present to continue estate account weeding. Weeds of particular note are Kora (*Cyperus rotundus*) and Couch grass (*Panicum repens*). The former is particularly prevalent in plots 145, 155, and in the half-acre plot. An attempt was made to shade out this weed with closely planted Dadaps in a small area at the lower end of the plot 143; the dense shade certainly kept the weed in check, but in November, 1923, the density of the shade was considered to be adversely affecting the tea, and the Dadaps were cut out. The Kora cannot be said to have been eradicated by this method. In plot 145 weekly scraping was tried in a small area for three months. The plants certainly assumed a sickly appearance, but reappeared regularly. This method would not be practicable over a large area. Forking up the roots has been tried, but has never been completely successful. Couch grass is worst in a swampy portion of plot 148. Considerable labour has been expending in forking out this weed, but the land is interspersed with rocks and complete eradication is impossible.

Disposal of Produce.

All tea leaf was sold to New Peradeniya estate for a number of years. Since May, 1922, the leaf has been manufactured for the Experiment Station by New Peradeniya estate at a charge of 14½ cents per pound, and this has proved more profitable. The gross average per pound for the last sale in September, 1923, was 90 cents.

TABLE A.

Actual Yields of Made Tea in Pounds per Plot during the Years 1906–17. Made Tea being calculated at 24·15 per Cent. of the Fresh Leaf.

Year.	141 Soluble Manure Mixture, 100 lb.	142 Soluble Manure Mixture, 100 lb. Indigofera.	143 Prunings buried.	144 Dadaps planted, 1902.	145	146	147 Crotalaria.	148 Crotalaria.	149 Dadaps, July, 1904.	150 Albizzias, July, 1904.	151 Crotalaria, 1910.	152	153	154	155 Cattle Manure, 30 Tons, March, 1908.	Rainfall.
																Inches.
1906 ..	37	46	39	67	91	68	63	80	51	72	20	21	24	18	24	79·97
1907 ..	297	378	323	492	628	594	588	728	637	733	86	77	235	177	268	63·34
1908 ..	296	384	299	431	543	508	492	608	653	690	188	192	255	176	342	69·06
1909 ..	347	368	390	524	624	712	753	732	1,077	1,102	210	237	346	266	648	71·75
1910 ..	646	756	710	853	1,010	990	970	950	1,135	1,200	466	525	694	547	962	93·84
1911 ..	410	467	402	620	686	1,064	1,177	1,138	1,360	1,485	357	366	524	447	723	93·85
1912 ..	620	725	695	910	1,022	848	890	888	990	1,370	578	592	750	645	1,200	78·72
1913 ..	442	512	468	590	795	1,021	1,008	889	1,445	1,505	381	377	486	452	854	120·70
1914 ..	774	900	743	1,060	1,269	1,000	968	951	1,235	1,226	552	515	600	556	1,271	82·72
1915 ..	432	452	417	701	740	1,118	1,034	910	1,518	1,394	248	245	270	267	549	87·59
1916 ..	792	970	814	1,105	1,272	940	950	826	1,142	1,228	265	234	212	216	1,290	84·06
1917 ..	490	545	499	758	728	1,213	1,106	940	1,632	1,479	—	—	—	—	856	99·46

The tea in plots 151–154 was cut out in August, 1916.

TABLE B.

Actual Yields of Made Tea in Pounds per Acre during the Years 1918–23. Made Tea being calculated at 24·15 per Cent. of the Fresh Leaf.

Yr.	141 A: 286 lb. Groundnut Cake. 50 lb. Sulphate of Potash. 20 lb. N.; 20 lb. K2 O.	141 B: 286 lb. Groundnut Cake. 20 lb. N.	142 A: 286 lb. Groundnut Cake. 111 lb. Superphosphate. 20 lb. N.; 20 lb. P2 O5	142 B: 286 lb. Groundnut Cake. 20 lb. N.	143 A: 111 lb. Superphosphate. 50 lb. Sulphate of Potash. 20 lb. P2 O5; 20 lb. K2 O.	143 B: 286 lb. Groundnut Cake. 111 lb. Superphosphate. 50 lb. Sulphate of Potash. 20 lb. N.; 20 lb. P2 O5. 20 lb. K2 O.	144: Dadaps: Stumps planted to replace old Dadaps in June, 1921.	145: Control.	146 A: 286 lb. Groundnut Cake. 50 lb. Sulphate of Potash. 20 lb. N.; 20 lb. K2 O.	146 B: 286 lb. Groundnut Cake. 20 lb. N.	147 A: 286 lb. Groundnut Cake. 111 lb. Superphosphate. 20 lb. N.; 20 lb. P2 O5.	147 B: 286 lb. Groundnut Cake. 20 lb. N.	148 A: 111 lb. Superphosphate 50 lb. Sulphate of Potash 20 lb. P2 O5; 20 lb. K2 O.	148 B: 286 lb. Groundnut Cake. 111 lb. Superphosphate. 50 lb. Sulphate of Potash 20 lb. N.; 20 lb. P2 O5. 20 lb. K2 O.	149: Dadaps: Fresh Dadap Stumps were planted in July, 1920; old Dadaps cut out in August, 1922.	150: Albizzias: Old Albizzias cut out in January, 1921. Seed planted September, 1922.	155 A: Cattle Manure.	155 B: Cattle Manure.	Rainfall. Inches	Rainfall. Wet Days.
1918	394	430	453	517	347	426	1,060	1,066	395	403	410	410	337	374	915	1,071	546	681	91·84	168
1919	276	279	304	314	249	277	720	622	462	495	490	425	383	407	1,085	1,122	368	382	92·04	177
1920	517	550	552	585	496	538	1,159	1,276	752	767	684	699	613	642	1,662	1,547	560	604	101·50	174
1921	204	216	224	252	189	218	619	505	345	358	331	298	248	267	925	975	257	277	67·91	169
1922	264	265	281	285	260	275	666	647	381	376	364	354	309	299	904	1,122	385	383	83·27	141
1923	292	304	325	322	254	268	752	620	500	501	460	415	324	328	1,038	1,068	315	315	116·08	172

All the plots receive an application of 100 lb. basic slag and 60 lb. sulphate of potash after pruning.

TABLE C.

Actual Number of Bushes in Bearing on the Tea Plots of the Experiment Station, Peradeniya, from 1907–23.

Year.	Plot 141.		Plot 142.		Plot 143.		Plot 144.	Plot 145.	Plot 146.		Plot 147.		Plot 148.		Plot 149.	Plot 150.	Plot 151.	Plot 152.	Plot 153.	Plot 154.	Plot 155.		Total.
	A	B	A	B.	A	B			A	B	A	B	A	B							A	B	
1907 ..	1,178		1,403		1,361		1,692	2,133	1,840		1,599		1,910		2,093	2,700	765	935	1,032	692	1,144		22,477
1908 ..	1,222		1,505		1,453		1,873	2,166	1,948		1,712		2,020		2,114	2,806	840	768	983	690	1,027		23,125
1909 ..	—		—		—		—	—	—		—		—		—	—	—	—	—	—	—		—
1910 ..	—		—		—		—	—	—		—		—		—	—	—	—	—	—	—		—
1911 ..	1,912		1,829		1,880		1,859	2,560	2,294		2,089		2,046		2,132	3,122	1,642	1,672	1,415	1,538	2,104		30,102
1912 ..	—		—		—		—	—	—		—		—		—	—	—	—	—	—	—		—
1913 ..	1,979		2,004		1,867		2,255	2,592	2,245		2,082		2,157		2,239	3,137	1,623	1,779	1,964	1,869	2,158		33,382
1914 ..	—		—		—		—	—	—		—		—		—	—	—	—	—	—	—		—
1915 ..	—		—		—		—	—	—		—		—		—	—	—	—	—	—	—		—
1916 ..	—		—		—		—	—	—		—		—		—	—	—	—	—	—	—		—
1917 ..	—		—		—		—	—	—		—		—		—	—	—	—	—	—	—		—
1918 ..	935	965	989	1,065	955	883	2,286	2,460	1,153	1,162	1,024	1,143	1,009	1,159	2,114	3,094	—	—	—	—	1,144	1,014	24,554
1919 ..	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1920 ..	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1921 ..	971	972	839	826	834	802	1,982	2,485	1,183	960	1,008	984	919	1,162	2,307	3,022	—	—	—	—	1,091	965	23,312
1922 ..	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1923 ..	962	972	950	1,077	899	817	2,113	2,278	1,178	1,144	984	1,128	925	1,107	2,270	3,018	—	—	—	—	1,133	949	23,904

SECTION 2.

RUBBER.

The rubber areas of the Experiment Station are most conveniently dealt with in blocks rather than by individual plots. Each block will be taken in turn, and a short account given of all experiments carried out therein.

Block 1.

Plots 68 to 87 (excluding the north-eastern half of plots 68 to 76, which are continued across a road running north-west and south-east from the Totadeniya paddy fields to the " B " cacao, and which will be dealt with separately under the name of " New Avenue Rubber ").

This block must again be divided into three sub-blocks :—

Plots 78–87 inclusive.—These plots lie at the north-west end of the block, and include the oldest Para rubber on the station, having been planted in April, 1905. Plots 83 to 86 were planted under old cacao, which accounts for the irregularity of the present rows. The rubber was originally planted 15 feet by 15 feet, and plots 78 to 82 were interplanted in 1905 with Dadaps and various catch crops. The treatment given was as follows :—

Plot 78.—Groundnuts followed by clean weeding ; and in 1919 and 1920 an application of 150 lb. sulphate of ammonia, 100 lb. concentrated superphosphate, and 100 lb. sulphate of potash per annum.

Plot 79.—Two crops of groundnuts followed by *Crotalaria striata.*

Plot 80.—Groundnuts followed by Lemon grass.

Plot 81.—Groundnuts followed by Cassava ; followed by clean weeding till 1909 when *Indigofera anil* was sown.

Plot 82—Two crops of groundnuts followed by clean weeding till 1909 when *Crotalaria striata* was sown.

Plot 87.—Vigna and Crotalaria followed by clean weeding.

The cacao was cut out of plots 83 to 86 in 1912.

[NOTE.—In the following notes letters represent rows of trees, *e.g.*, 82 A = row A in plot 82.]

Tapping Experiments.—The first recorded tapping experiment in this block was commenced in *plot 78* in January, 1910. Row A was tapped on the full herring-bone system with the Bowman-Northway No. 2 knife and sharp roller pricker.

Row B was tapped on the half spiral, left to right.

Row C was tapped on the half spiral, right to left.

The same pattern of knife was used throughout. At first only trees of a girth of 17 inches at 18 inches from the ground were included, but other trees were taken in when they reached these dimensions.

In twelve months—

Row A gave 12·98 oz. per tree.

Row B gave 12·07 oz. per tree.

Row C gave 13·26 oz. per tree.

In the same year another method of tapping was tried in *plot 79*, *i.e.*, that of incision instead of excision, in order to avoid removal of bark and to maintain direct communication all round the tree between the leaves and the roots. Small vertical channels in the outer bark were cut at 1 inch intervals from 6 feet to ground level, and these were pricked down with transverse cuts 1 inch apart. Two channels on opposite sides of the trees were made on each alternate day. This system was continued till the available space was covered, the time taken depending on the circumference of the tree. Only half the trees were tapped in April, 1910, when the system was commenced, the other half being tapped in May, and so on throughout the year.

The total yield for twelve months was 1 lb. 1·82 oz. per tree. The chief drawback was the large proportion of scrap, which amounted to 44 per cent. of the total dry rubber.

Plot 81 was first tapped in June, 1910, by means of excision with the Bowman-Northway knife without pricking.

Row A was tapped on the full herring-bone.

Row B was tapped on the half spiral, left to right.

Row C was tapped on the half spiral, right to left.

The yields for twelve months were—

	Per Tree. lb.	oz.
Row A	1	9
Row B	1	6
Row C	1	3

The omission of pricking greatly reduced the proportion of scrap.

Plot 82.—Row A was tapped with two cuts on opposite quarters. Row B with one cut on the third. The latter row was only tapped for six months, while row A was tapped for eight months; the results, therefore, are not truly comparable.

Plot 83.—Tapping was commenced in June, 1910, when the cacao, amongst which this rubber had been planted, was still standing. Row A was tapped with the full herring-bone, row B half spiral, right to left, row C full spiral. The Bowman-Northway No. 2 knife and pricker were used.

The yields per tree for ten months were—

	lb.	oz.
Row A	1	0
Row B	0	13
Row C	0	13

Details of all the above tapping experiments will be found in Royal Botanic Gardens Circulars, Vol. V., No. 19. This circular also gives soil analyses of these plots.

From August, 1910, to September, 1911, row 82 A was tapped on opposite quarters at the same time, for comparison with 82 B which was tapped on one-third circumference. As the two tappings were not conducted at the same time, and the number of cuts and tapping differ, no definite conclusions could be drawn.

Tapping with a single V on half the circumference, at a height of 18 inches from the ground, was begun on 40 trees of *row 82 C* in June, 1911. In Bulletin No. 12 this tapping is compared with that of 82 A and 82 B, but, as stated by the writer of that bulletin, there are several objections to the comparison. It was concluded, however, from the results of continued tapping in this row, that the practice of using a single cut appeared to be justified, though it was not decided whether the V or the straight cut was best.

The Bamber Pricker.—This implement was tried first in April, 1910, in *plot 79*. Tapping was begun on half the trees in April and on the remaining trees in May, the trees being thus tapped during alternate months throughout the year.

Two channels per day were cut on alternate days until the circumference of the tree was exhausted. The channels were made 1 inch apart on opposite sides of the trees. The average yield per tree for twelve months was 1 lb. 2 oz. Scrap amounted to 49 per cent. In addition, 1·18 oz. of ground scrap per tree were collected.

In April, 1911, a new method was inaugurated with the same trees. In this case tapping of all the trees was started together and re-started every two months. As in the first experiment the duration of the tapping period depended on the girth of the tree. The method was continued up to March, 1914 (three years), and the average yield per tree was 2 lb. 2 oz. During the whole period of four years occupied by the two experiments the percentage of scrap was 42·5.

In February, 1912, another experiment with the Bamber Pricker was started in row 80 A. The trees were tapped daily for the first sixteen days in each month, and then rested for the remainder of the month. On each tapping day two channels were made side by side, $\frac{3}{4}$ inch apart, from the ground to a height of 6 feet. The yield for a year by this method was 1 lb. 12 oz., or rather more than three-quarters of that obtained during the same year in plot 79 by the method previously described. The system of cutting channels on opposite sides of the tree, therefore, appeared preferable, and was introduced in row 80 A in May, 1913. The yield for the succeeding twelve months, however, was 1 lb. 4 oz. per tree, or rather less than three-quarters of that obtained from plot 79. The conclusion was that, with the Bamber Pricker, tapping daily for half the month yielded less than tapping on alternate days every two months. The percentage of scrap obtained in 80 A was 68 per cent. in 1912 and 65 per cent. in 1913. In January, 1913, further experiments with the Bamber Pricker were begun on 79 B and 80 B. Two opposite channels were tapped together on alternate days, but the channels were only 3 feet high instead of 6 feet. 79 B had been previously tapped with the Bamber Pricker to 6 feet from the ground, though the bark only showed slight traces of that tapping. The trees in 80 B had not been previously tapped. The average yield of 80 B was practically identical with that of 79 A and C for the same period, though the trees in 80 B were tapped to 3 feet, while those of 79 A and C were tapped to 6 feet. On the other hand, the average of 79 B where the trees had been previously tapped was much less. The general

conclusion of all these experiments was that the Bamber Pricker could not be recommended on physiological grounds, while from the practical point of view the high percentage of scrap was a grave disadvantage.

The Northway Pricker.—The Northway serrated knife was first used in 87 A in January, 1912. A shallow vertical channel was cut from a height of 5 feet down to the base. Oblique incisions were then made along this channel, herring-bone fashion, at a distance of 1 foot apart and alternately on opposite sides of it. The length of this incision was 1½ inches. Two days later new incisions were made half an inch below the former, and this was continued on alternate days until the area bordering the channel had been completely tapped. A new channel was then made 2 inches from the first, and the process continued.

The yields for the whole period of three years were as follows :—

Year.	Average Girth.	No. of Tappings.	Yield per Tree.	Yield per Tree per Tapping.
	Inches.		lb. oz.	oz.
1912 ..	24·0 ..	156 ..	1 1 ..	11
1913 ..	27·0 ..	138 ..	1 8 ..	17
1914 ..	30·3 ..	178 ..	2 1 ..	19

From every point of view this system was adjudged to compare very unfavourably with other methods. The percentage of scrap for the whole period was 28 per cent.

In August, 1912, a further experiment was begun with the Northway Pricker in 86 A and 86 C. In this case the trees were tapped daily with five complete V's (full herring-bone) instead of five alternating single cuts. These daily cuts were first made 1 inch apart, but later ¾ inch apart. Allowing for a rest of six weeks during wintering, tapping was completed in seven and a half months. As the cuts were not then properly healed, the trees were not then re-tapped. The yield per tapping by this method was 15 per cent. less than by the slower method described in 87 A. It was obtained in one-third of the time, but the trees could not be immediately re-tapped.

The knives and implements used in these early tappings can, at present, be seen in the Departmental Museum.

Daily and Alternate Day Tapping.—A further series of experiments was commenced in January, 1912, in plot 87. The object was again to contrast the yields obtained by

continuous alternate day tapping and daily tapping during alternate months. In addition, in each method two different types of cuts were employed. The area of bark to be removed was ultimately the same in all cases.

Details and yields up to the end of 1914 will be found in the following table:—

Plot No.	87 E	87 B	87 D	87 C
Number of trees	25	25	25	25
Average girth (inches), December, 1911	25	24·7	25·5	24·3
Method	Half herring-bone to left	Half herring-bone to left	Full herring-bone	Full herring-bone
Fraction of circumference	One quarter	One quarter	Half	Half
Number of cuts	4, 1 foot apart	4, 1 foot apart	2, 1 foot apart	2, 1 foot apart
Tapping interval	Alternate days	Daily in alternate months	Alternate days	Only in alternate months
1912.				
Number of tappings	172	173	172	173
Yield (in lb. and oz.) per tree	1·14	1·13	2·0	1·13
Percentage scrap	16	13	15	12
1913.				
Number of tappings	146	165	146	165
Yield (in lb. and oz.) per tree	1·14	2·5	2·12	2·14
Percentage scrap	17	14	13	10
1914.				
Average girth, January	29·9	30·2	31·4	29·7
Number of tappings	183	181	183	180
Yield (in lb. and oz.) per tree	3·3	3·3	3·11	3·12
Percentage scrap	12·7	11·8	12·8	9·0
1915.				
Number of tappings	180	179	180	179
Yield (in lb. and oz.) per tree	2·7	3·2	2·4	2·9
Percentage scrap	16·4	13·8	21·2	14·3
1912–1915.				
Tappings	681	698	681	697
Total yield (in lb. and oz.)	9·6	10·7	10·11	11·0

The alternate day tapping yielded more scrap than the daily tapping. It was considered on the whole immaterial whether the trees were tapped on alternate days throughout the year or daily in alternate months.

Time Interval Experiments.—In July, 1912, a further set of experiments was started in *plots 82, 78, and 81.* The factors involved were a varying number of cuts and a varying number of tappings per week on one-third circumference. The trees were divided into six groups. In the earlier bulletins dealing with this experiment, all these six groups are dealt with as one experiment. In the later bulletins, rows 81 A, 81 B, and 81 C are considered separately. For the sake of simplicity all the results of the six groups are included in the following table up to June, 1918, when the tapping by this method of rows 80 C, 78 A, and 78 B ceased.

The tapping of rows 81 A and 81 B by this method appears to have been continued to the end of 1919, and of row 81 C till August, 1919. In the case of row 82 B it appears that by some error the third section was tapped with three cuts to the right instead of four cuts to the left. The results are therefore not strictly comparable. From June, 1914, a new untapped row, *80 C*, was substituted for row 82 B. In 1914 this row 80 C was tapped by error on alternate days instead of three times per week, and thus received 182 tappings instead of 156. The trees were rested during the wintering season in 1913 only.

Plots.	82 B.	80 C.	78 A.	78 B.	81 A.	81 B.	81 C.
Number of trees at commencement	39		25	25	25	25	25
Average girth (inches), June, 1912	25·3		25	25	27	25·6	25
Number of cuts	2, 5, & 3, 1 foot apart		4, 1 foot apart	4, 1 foot apart	2, 1 foot apart	2, 2 feet apart	1 at 3 feet
Tappings per week	3		2	1	3	3	6
1912 (6 months).							
Number of tappings	85		52	27	74	77	153
Yield (in lb. and oz.) per tree	1·8		1·6	0·11 oz.	1·7	1·5	1·6
1913.							
Number of tappings	139		86	46	126	131	254
Yield (in lb. and oz.) per tree	2·5		2·11	1·9	2·3	2·14	2·10

Plots.	82 B.	80 C.	78 A.	78 B.	81 A.	81 B.	81 C.
1914.							
Average girth	..29·3	.. 29	..30·2	..32·5	..30·7	..30·2	
Number of tappings	.. 182	.. 105	.. 52	.. 155	.. 155	.. 311	
Yield (in lb. and oz.) per tree	4·4	..3·11	.. 2·1	..3·13	..3·12	.. 3·1	
1915.							
Number of tappings	.. 157	.. 104	.. 52	.. 155	.. 154	.. 308	
Yield (in lb. and oz.) per tree	4·9	.. 4·0	.. 2·0	.. 4·0	.. 3·8	.. 3·6	
1916.							
Number of tappings	.. 154	.. 105	.. 52	.. 156	.. 155	.. 311	
Yield (in lb. and oz.) per tree	4·13	..4·11	..1·15	.. 4·1	..3·10	.. 4·0	
1917.							
Number of tappings	.. 153	.. 104	.. 52	.. 152	.. 153	.. 305	
Yield (in lb. and oz.) per tree	5·15	.. 5·0	.. 2·6	.. 3·9	.. 3·6	.. 3·7	
1918 (6 months).							
Number of tappings	.. 76	.. 49	.. 27	.. 74	.. 76	.. 115	
Yield (in lb. and oz.) per tree	2·6	..1·15	.. ·12	.. 1·4	.. 1·5	.. 1·8	
Total tappings for whole period	946	.. 605	.. 308	.. 892	.. 901	..1,757	
Total yield per tree for whole period (in lb. and oz.)	25·12	..23·6	..11·6	..20·5	..19·12	.. 19·6	
Yield per tree per tapping (oz.)	·44	.. ·62	.. ·59	.. ·36	.. ·35	.. ·18	

The summarized conclusions from the results in rows 82 B and 80 C, 78 A and 78 B were that the yield per tapping in twice-per-week tapping was greater than in thrice-per-week tapping. Tapping once per week did not give a greater yield per tapping than tapping twice per week. The greatest quantity of rubber was obtained by the most frequent tapping, but the total yield in tapping three times per week was only about 12 per cent. greater than that obtained by tapping twice per week. The percentage of rubber in the latex increased as the time interval increased. The difference between the percentages of scrap obtained in tapping twice per week or three times per week was small. In considering the yields of rows 81 A, 81 B, and 81 C it was noticed that the single cut tapped six times per week yielded, per tapping, approximately half as much as the two cuts tapped three times per week.

V Tapping versus *Single Oblique Cut.*—In January, 1914, a fresh experiment on this point was started on two groups of ten trees each in *80 C, 81 A*, and *81 B*. Both groups were tapped on one-third circumference; one with a single V at 3 feet, the other by a single oblique cut to the left at the same height.

The trees were tapped on alternate days.

The results for three years are given below:—

Year.	No. of Tappings.	V Tapping. Yield per Tree. lb. oz.	V Tapping. Percentage Scrap.	Single Cut. Yield per Tree. lb. oz.	Single Cut. Percentage Scrap.
1914	182	2 9	11·7	2 13	12·2
1915	179	3 2	13·0	3 3	13·3
1916	182	3 7	10·5	3 5	11·1
	Total	9 2		9 5	

Change-over Tapping.—In January, 1914, tapping on two groups of seventeen previously tapped trees in *row 78 C* was commenced.

The trees were tapped with a single cut to the left at 15 inches on one-quarter circumference.

In one group the trees were tapped down continuously in the same quarter; in the other, tapping was transferred to the opposite quarter every three months. At the time of the transfer the two sides were tapped together for about six tappings. The average girth of each group was 30·2 inches in December, 1913.

The yields per tree were—

Year.	Continuous Yield in lb. oz.	Change-over Yield in lb. oz.
1914	2 4	2 0
1915	2 4	3 1
1916	2 2	3 0
1917	2 14	3 4
1918	2 11	3 3
1919 (5 months)	1 2	1 3
Total	13 4	15 11

The results indicated that, when tapping on quarters, a slightly increased yield might be obtained by changing over; but if double tapping was not practised at the time of the change, and the change was made at a longer interval, the advantage would most probably not be as great as in the case in question.

A second change-over experiment was started in 1915 on *row 82 C*. The trees were divided into two groups of 19 trees each and were tapped with a V cut on the half circumference, 3 feet from the ground. The change over was made every three months, and as before both sides were tapped together for six tappings at the time of changing.

The yields were as follows :—

Year.	Continuous Yield in lb. oz.	Change-over Yield in lb. oz.
1915	3 4 ..	3 0
1916	3 4 ..	3 6
1917	3 9 ..	2 13
1918	3 11 ..	3 0
Total ..	13 12	12 3

Double tapping at the time of changing was stopped in 1917. The experiment showed no advantage in yield in change-over tapping on a half where double tapping was practised at the time of changing over; and a loss where double tapping was not practised.

Changing over every three months appeared to have a detrimental effect on yield, though this might not hold good for a longer interval.

The results of both experiments in change-over tapping at an interval of three months were summarized as follows :—

(1) A slightly increased yield was obtained by change-over tapping when tapping on quarters; but no increase when tapping on halves.

(2) Six months after tapping, bark renewal was better in change over than in continuous tapping on quarters; but there was no difference in the case of tapping on halves.

(3) The weight of rubber from a given volume of latex was on the average the same, whether the tapping is continuous or change over.

Manurial Experiments.—The first manurial experiment was started in 1913 on trees in *plots 83, 84, 85,* and *86.* The general scheme was to ascertain the effect of complete organic and mineral mixtures, and of nitrogen, potash, and phosphoric acid, respectively, on the general growth, girth development, latex, and rubber yield of the trees. The trees included in the experiment had originally been planted among cacao, and the rows are on that account irregular. Two rows of trees were used for each manurial mixture, an unmanured row being left between each plot.

The manures have been applied annually and, until 1923, by the following method:—

A trench, 3 feet wide and 6 inches deep, was dug between each of the rows under treatment, a proportion of the leaves from the surrounding ground were swept into this trench, and the manures broadcasted on the top of these leaves; the leaves and manures were then mixed with the soil at the bottom of the trench by means of mamoty forks; more leaves were swept into the trench which was then covered in by replacing the surface soil.

From 1923 the trenches have been dug across the rows between the trees instead of down the middle of the two rows. Otherwise the procedure is the same.

Most of the trees were tapped on the full herring-bone system from October, 1912, to November, 1913, and then rested till the end of that year. The yields from 1913 are not included in the experiment. A number of trees having an average girth measurement of from 29·4 to 29·7 inches at 3 feet from the ground were then selected for comparative tapping which was begun on January 1, 1914. The tapping system is one cut to the left on one-third circumference at 26 inches from the ground at an angle of $22\frac{1}{2}^{\circ}$.

In October, 1916, the unmanured rows dividing the manured plots were cut out leaving an average of 90 trees to the acre. The manured plots are now divided by a drain. In 1918 row 86 B, one of the rows manured with the inorganic mixture, was cut out, and after that year no manure was applied to the remaining row. Details of the experiment will be found in the following table.

Old Rubber Manurial Experiment.

No. of Rows.	No. of Trees at Start of Experiment.	Average Girth, January, 1914.	Average Girth, January, 1924.	Increase in Girth in 10 Years.	Manures applied per Acre.	Average Yields per Tree in lb. and oz. of Dry Rubber.										
						1914.	1915.	1916.	1917.	1918.	1919.	1920.	1921.	1922.	1923.	Total.
		In.	In.	In.	*General Mixture.*	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.
83 A, B..	29	29·4	54·09	24·69	*1913.*—Groundnut cake 300 lb., fish guano 150 lb., blood meal 100 lb., steamed bone dust 100 lb., sulphate of ammonia 40 lb., nitrate of potash 150 lb. = 840 lb. of the mixture per acre.	2 4	3 0	3 13	4 5	4 8	4 13	5 4	4 9	4 6	5 4	41 3
					1914.—No manures applied.											
					Modified Mixtures applied:											
					1915.—Groundnut cake 156 lb., fish guano 110 lb., blood meal 80 lb., steamed bone dust 52 lb., sulphate of ammonia 39 lb., muriate of potash 104 lb. = 520 lb. of the mixture per acre.											
					1916.—Groundnut cake 200 lb., blood meal 200 lb., steamed bone meal 136 lb., sulphate of potash 75 lb., sulphate of ammonia 60 lb. = 671 lb. of the mixture per acre.											
					1917 to 1923.—Same mixture applied annually.											
					Excess of Nitrogen.											
83 D and 84 A	42	29·7	55·58	25·88	*1913.*—Groundnut cake 300 lb., fish guano 200 lb., blood meal 150 lb., steamed bone dust 20 lb., sulphate of ammonia 90 lb., muriate of potash 80 lb. = 840 lb. of the mixture.	2 6	3 8	3 1	4 7	4 8	4 8	5 4	4 8	4 10	5 4	42 13
					1914.—No manures were applied this year.											
					1915.—Groundnut cake 95 lb., fish guano 100 lb., blood meal 140 lb., sulphate of ammonia 120 lb., sulphate of potash 15 lb. = 470 lb. of the mixture per acre.											
					1916.—Groundnut cake 182 lb., steamed bone meal 43 lb., blood meal 300 lb., sulphate of ammonia 150 lb. = 675 lb. of											

Though the yields and average girth measurements of the trees 86 have been inserted up to date, the figures are not comparable since one row was cut in 1918 and manuring stopped in that year. Of the remainder it must be noted that the unmanured plot has shown the best growth, as measured by girth increase. The lowest girth increase as well as the lowest yield is given by the excess of potash plot, while the highest yield over the whole period is given by the excess of phosphoric acid plot.

Weekly individual yields of latex have been recorded since July, 1922, for all the trees tapped in these manurial experiments, with the principal object of identifying any exceptional yielders with a view to future budding operations.

Value of Dynamite: Plot 77.—In this plot an experiment was carried out in November, 1912, of planting rubber in (*a*) holes blasted with a whole cartridge of dynamite; (*b*) ordinary hand-dug holes.

The size of the hand-dug holes is not stated, but they are believed to have been of the size usually dug for planting rubber. Three rows were planted by each method. Two-year old stumps from seed of old Henaratgoda trees were planted. The trees have not been tapped, but the average girth per tree, as shown below, indicated that no advantage was obtained by blasting holes with dynamite; the cost, moreover, was considerably in excess of that of hand digging:—

	Dynamited Holes. Inches.	Hand-dug Holes. Inches.
Average girth of trees in November, 1920 ..	29·43 ..	30·26
Average girth of trees in January, 1924 ..	37·80 ..	40·17

The Avenue Rubber: Plots 68-76.—This forms the last subdivision of the first block to be dealt with.

The land was cleared from old cacao and planted in June, 1913, with stumps grown from seed from old trees in the Botanic Gardens. The trees were planted in avenues, 15 feet by 15 feet apart, with a space of 40 feet between each avenue; this method gave 112 trees to the acre. All the trees were planted in dynamited holes. Vacancies were supplied periodically in the young stages. Successive crops of green manures and catch crops were grown while the rubber was young, green gram, *Crotalaria striata*, groundnuts, and cow peas being used. Forking, disc harrowing, ploughing, and burying of green material were regularly done. In June, 1916, rows of *Leucæna glauca* were sown between the rubber avenues; these plants did well, and for some years were regularly lopped, and yielded a good supply of green material.

In 1916 a manurial experiment was started, each of the seven avenues being given a different treatment.

The manures were applied in the same manner as described for the old manurial experiments in plots 83 to 86. As in that case from 1923 onwards the trenches have been dug across instead of down the avenues. The lime is broadcasted over the whole plot and disc harrowed or lightly forked in with mamoty forks where the disc harrow cannot go. Details of this experiment will be found in the following table :—

No. of Avenue.	No. of Trees at Start of Tapping.	Average Girth at Start. In.	Treatment of Plots.	Average Yields per Tree. 1922. lb.	1922. oz.	1923. lb.	1923. oz.	Total. lb.	Total. oz.
Control	43	29·19	Control. Lime only at 8 lb. per tree or 896 lb. per acre	2	3	3	1	5	4
I.	45	28·96	Superphosphate 138 lb., basic slag 147 lb., sulphate of potash 120 lb., *i.e.*, 405 lb. of the mixture per acre with the addition of lime at the rate of 8 lb. per tree or 896 lb. per acre.	1	13	2	13	4	10
II.	47	28·53	Nitrolim 277 lb., sulphate of potash 120 lb. = 397 lb. per acre with the addition of lime at the rate of 8 lb. per tree or 896 lb. per acre.	2	0	2	14	4	14
III.	49	29·23	Nitrolim 277 lb., superphosphate 138 lb., basic slag 147 lb. = 562 lb. of the mixture per acre with the addition of lime at the rate of 8 lb. per tree or 896 lb. per acre.	1	12	2	6	4	2
V.	47	29·52	Same manures as for Avenue I., but without lime	1	15	2	13	4	12
VI.	50	28·33	Same manures as for Avenue II., but without lime	1	14	2	7	4	5
VII.	50	29·51	Same manures as for Avenue III., but without lime	1	11	2	5	4	0

N.B.—In 1917, for one year only the quantity of lime was reduced from 8 lb. to 4 lb. per tree. In July, 1921, 19 trees in all were thinned out.

Block 2.

The New Avenue Rubber.—This area comprises the north-eastern half of plots 68 to 76. The rubber was planted in July, 1920, to form a continuation of the rows of the avenue rubber. The original planting was with stumps grown from seed from old trees in the Botanic Gardens. Vacancies have since been supplied with stumps from the Botanic Gardens grown from Henaratgoda seed; and later with stumps grown in the Experiment Station nurseries from seed of No. 2 tree, Henaratgoda.

The soil is poor, and the original drains in the steep portion were extremely inadequate, resulting in a great deal of soil erosion. At the end of 1923 the existing drains were enlarged, and some new drains dug.

At the time of planting, the land was covered with a mixed and irregular growth of Dadaps, *Leucæna glauca*, and *Gliricidia maculata*. These were uprooted and removed in July, 1921; in October of the same year rows of the following green manures were planted or sown:—*Gliricidia maculata* (3 foot cuttings), *Leucæna glauca*, *Tephrosia candida*, *Tephrosia Hookeriana*, Soya beans, Black gram, *Crotalaria striata*, *Crotalaria incana*, *Crotalaria usaramoensis*, *Crotalaria juncea*, Dhall, *Indigofera arrecta*.

In December, 1921, all dead stumps and logs were systematically removed.

The green manuring scheme was later reorganized; the steep area above the central drain running across the avenues being treated separately from the remaining flat area.

The steep portion was planted with groundnuts in contour lines in June, 1922. The subsequent forking involved in harvesting the crop renders groundnuts unsuitable for such planting on steep land. In October, 1923, attempts were made to establish contour hedges of *Crotalaria usaramoensis* and *Tephrosia candida*, but, partly owing to excessive rain, the attempt failed. At the present time the majority of the weeds are left undisturbed on this steep portion in order that some protection may be afforded to the soil pending an attempt to establish *Indigofera endecaphylla*. On the flat portion some of the green manures proved unsuitable and were replaced by those which did better. At the present time *Gliricidia maculata*, *Tephrosia candida*, *Cassia hirsuta*, *Centrosema pubescens*, and *Crotalaria striata* occupy the ground. The green manure loppings have been periodically mulched round the rubber trees.

Block 3.

The "B" Cacao Rubber.—This small block occupies the upper portion of plots 63 to 67, while the "B" cacao area occupies the lower portion. It was originally planted with cacao in 1914, but the cacao died out, with the exception of one or two trees.

In June, 1914, the block was planted up with two-year old rubber stumps grown from seed of a small leaved tree selected by Mr. T. Petch at Henaratgoda.

The block was interplanted with *Tephrosia candida*, which was periodically cut and mulched round the trees.

A number of Dadaps are also at present standing in the plot. The rubber has not yet been tapped.

Block 4.

Plots 11–15.—This block must be considered in two sub-divisions :—

Plots 11–13.—Previous to 1915 plots 11 and 12 were under *Manihot dichotoma*, one of the rubber-producing plants which was tried in the early days of the industry. Plot 13 was vacant. In 1915 the *Manihot dichotoma* was dug out of plots 11 and 12, and after ploughing and discing the land and digging drains, two-year old rubber stumps, raised at Henaratgoda from seed of No. 2 tree, were planted 25 feet by 25 feet in the three plots.

The rubber was interplanted with *Tephrosia candida*, and in 1919 with Dhall. Lime, at the rate of 5 lb. per tree, was applied in 1916. Vacancies were supplied with stumps from the original source. The rubber has not been tapped. A small patch of *Centrosema Plumieri* has been established in the north-eastern end of plot 13.

Plots 14 and 15: Individual Yield Experiments.—These two plots were planted in June, 1912, with one-year old stumps raised from seed of No. 2 tree, Henaratgoda. The stumps were planted 20 feet by 15 feet in hand-dug holes manured with cattle manure. Vacancies were supplied in 1913 with stumps grown at Peradeniya from seed of No. 2 tree, Henaratgoda, and in the same year *Indigofera arrecta* was broadcasted among the young rubber. It is recorded in that year that continued drought killed many of the young plants. Supplying was done again in 1915. The plots were ploughed and disced while the rubber was young. In 1916 a selective thinning was carried out, leaving a total of 161 trees in the two plots. The extreme north-eastern end of these two plots was planted in 1912 with stumps from another mother tree, but these were removed in 1913. The area of the two plots together is 1·78 acre.

In August, 1916, the trees, less two rows adjoining plot 16. were limed at the rate of 10lb. per tree. Otherwise, except for green material, the trees have received no manurial treatment.

Tapping was commenced in April, 1921, the individual yields of dry rubber from each of the 161 trees being separately recorded. The objects of the experiment were to study (*a*) the extent to which the seed of a high-yielding mother tree will transmit its yielding qualities to its offspring; and (*b*) the various factors influencing yield. The trees are tapped on the half circumference with a single cut to the left, at an angle of 16°, on alternate days throughout the year. The latex is brought to the store and coagulated in the cups. Each biscuit is then hung on a string bearing the number of the tree. The scrap is placed in a small basket beside the tree and collected weekly. When tapping was commenced specimens of the bark of every tree were taken for microscopical examination. The results of the first nine months' tapping were exhaustively reviewed by Messrs. Bryce and Gadd in Bulletin No. 55. The following are extracts from the authors' summary :—

(1) The offspring of a high-yielding mother tree are not all high yielders, but their mean yield is slightly higher than that of trees grown from non-selected seed.

(2) A smaller proportion of low yielders were found than is usual among trees raised from mixed seed.

(3) Considerable variation was found in the arrangement and distribution of the latex vessels.

(4) A greater uniformity of yield was found than is usual on estates.

(5) The production of a high-yielding strain of Hevea would necessitate rigid seed selection over several generations.

(6) If seed is selected from a high-yielding mother tree it should be borne in mind that the occurrence of low-yielding trees among the offspring will necessitate thinning to improve the average yield.

(7) It is indicated that yield is in close relationship with girth, cortex thickness, and number of latex vessel rows, the relationship being more marked in the case of girth and cortex thickness in this case than on mixed plots.

(8) Trees of the largest initial girth did not always show the largest girth increase.

(9) There was no relationship between yield and girth increase for the period under review.

(10) Trees of greater girth had generally more rows of latex vessels and thicker cortex.

(11) The use of seed from high-yielding mother trees only would result in a reduction of the preponderance of low yielders characteristic of mixed plots.

(12) Where selected seed is used, the character girth can be used as a basis on which to select trees for thinning.

A further bulletin, No. 68 has been issued by the same authors, and their conclusions are as follows :—

The yield is independent of vegetative vigour. Yield is an inherent character ; a tree is, in general, born a good yielder or a bad yielder, and no special cultivation of treatment will convert a poor yielder into a good yielder. It is possible, however, owing to disease or to unfavourable conditions that high yielders may become mediocre or even poor. Cultivation in estate practice should, therefore, be directed toward the maintenance of the trees in normal conditions of health and growth to enable them to give the greatest yields that their inherent character renders possible.

Below are given the yields of dry rubber (biscuit and scrap) from the commencement of tapping to the end of 1923.

Individual Yields of Dry Rubber in Plots 14 and 15 from April, 1921, to end of December, 1923.

No. of Tree.	April to December.						Total to Date.	
	1921		1922.		1923.			
	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.
1	4	0	7	0	5	5	16	5
2	3	0	3	1	3	2	9	3
3	2	14	5	4	5	8	13	10
4	3	2	5	14	5	2	14	2
5	5	0	10	8	10	9	26	1
6	3	8	5	12	7	6	16	10
7	4	0	7	10	9	10	21	4
8	2	9	3	11	3	12	10	0
9	2	8	3	9	4	2	10	3
10	3	0	3	11	3	14	10	9
11	2	12	3	8	2	4	8	8
12	4	14	8	9	8	11	22	2
13	2	15	5	7	6	8	14	14
14	3	2	4	11	5	12	13	9
15	2	8	4	4	3	7	10	3
16	2	9	2	15	4	2	9	10
17	3	8	4	10	4	4	12	6
18	4	8	7	9	7	13	19	14
19	3	0	5	3	4	15	13	2
20	3	4	5	8	6	2	15	14
21	3	4	6	8	7	8	17	4
22	3	13	5	8	2	4	11	9
23	3	15	4	11	7	0	15	10
24	2	10	4	9	5	11	12	14
25	3	4	6	4	5	3	14	11
26	3	0	4	13	3	10	11	7

Individual Yields of Dry Rubber in Plots 14 and 15 from April, 1921, to end of December, 1923—*contd.*

No. of Tree.	April to December.						Total to Date.	
	1921.		1922.		1923.			
	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.
27	4	2	6	3	5	4	15	9
28	2	9	4	3	3	15	10	11
29	2	15	4	5	2	15	10	3
30	3	6	5	10	4	9	13	9
31	2	14	4	4	3	7	10	9
32	4	8	9	6	8	2	22	0
33	3	10	5	6	4	15	13	15
34	2	10	4	15	5	0	12	9
35	2	10	3	9	2	10	8	13
36	4	7	6	15	9	0	20	6
37	3	5	7	3	5	13	16	5
38	5	0	8	14	9	11	23	9
39	3	4	4	15	3	10	11	13
40	3	2	6	0	5	1	14	3
41	4	4	7	13	7	5	19	0
42	4	11	7	10	6	9	18	14
43	3	5	5	4	4	14	13	7
44	2	15	4	10	4	0	11	9
45	4	4	8	0	7	9	19	13
46	2	12	3	13	3	0	9	9
47	4	4	7	8	5	6	17	2
48	4	14	4	9	3	11	13	2
49	3	11	6	4	5	3	15	2
50	2	13	3	15	3	10	10	6
51	4	10	9	0	9	8	23	2
52	3	15	6	10	6	7	17	0
53	3	4	6	0	6	1	15	5
54	4	5	9	7	4	0	19	12
55	3	4	5	3	4	1	12	8
56	2	15	4	13	3	8	11	4
57	4	5	7	15	8	7	20	11
58	3	0	5	4	5	4	13	8
59	3	3	4	11	3	15	11	13
60	3	7	5	13	5	13	15	1
61	2	15	5	7	5	5	13	11
62	4	0	5	8	4	5	13	13
63	3	14	6	15	4	14	15	1
64	4	1	6	15	7	9	18	9
65	3	15	7	5	7	4	18	8
66	3	6	6	14	7	1	17	5
67	5	15	11	0	7	15	24	14
68	3	11	6	7	5	14	16	0
69	3	12	6	8	6	10	16	14
70	3	13	6	11	7	6	17	14
71	4	9	8	0	6	15	19	8

Block 5.

Plots 151–154.—These plots were planted among the existing tea with rubber stumps from Udapolla estate in 1908, *i.e.*, five years after the planting of tea. Plot 151 was planted with stumps raised from seed of old trees, and plot 152 with stumps raised from seed of young trees. In 1909 vacancies were filled with supplies from the same source. In 1916 the tea was cut out, the plots limed at the rate of 1 ton per acre and lightly forked. In 1919 a two-day *versus* three-day tapping experiment was started in this block. In all 180 trees were originally selected for tapping, 90 trees (marked with white bands) divided in three series of 30 trees each to be tapped on alternate days, and 90 trees (marked with black bands) divided into 3 series of 30 trees each on every third day. Probably owing to the imperfect eradication of the tea, *Fomes lignosus* early made its appearance in this plot, and mainly from this disease 12 trees have been lost up to date. Eight of these casualties have occurred among the trees tapped on alternate days, and four among those tapped on every third day. The method of tapping is one cut to the left on the half circumference at an angle of $22\frac{1}{2}°$, at 30 inches from the ground. There is no change over till the bottom of the panel is reached. The experiment has been criticised on the ground that the cuts in both methods start at the same height from the ground, and therefore the two-day tapping cut first reaches the lower part of the tree, which is richer in latex; or, to view the matter in another way, tapping is started at a height from the ground which is not necessary in three-day tapping. To meet this objection a new experiment was started in 1922 (see Hilltop rubber).

The following table gives the results of the original experiment up to date :—

Two-day Tapping Yields per Tree.

Year.	Series 1.	Series 3.	Series 5.	Average of 3 Series
	lb. oz.	lb. oz.	lb. oz.	lb. oz.
1919 ..	3 2 ..	3 4 ..	3 4 ..	3 3
1920 ..	3 12 ..	3 7 ..	3 7 ..	3 8
1921 ..	4 3 ..	4 2 ..	4 5 ..	4 3
1922 ..	4 0 ..	4 5 ..	5 1 ..	4 7
1923 ..	3 9 ..	4 7 ..	4 13 ..	4 4
Total ..	18 10	19 9	20 14	19 9

	Three-day Tapping.								
	Series 2.		Series 4.		Series 6.		Average of 3 Series.		Percentage of Two-day Tapping Yields.
Year.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	Per Cent.
1919	2	5	2	4	2	8	2	6	73·6
1920	2	7	2	10	2	8	2	8	70·9
1921	2	15	2	12	3	3	2	15	97·6
1922	3	4	3	5	4	3	3	11	71·3
1923	1	15	2	6	3	1	2	7	57·5
Total	12	14	13	5	15	7	13	15	71·2

The two-day tapping was first changed over to the top of a new panel in February, 1922; the three-day tapping in July, 1923. This information throws some light on the comparative yields in 1921, 1922, and 1923. After the change over of the two-day tapping trees in February, 1922, the increase in yield per tree for that year, compared with 1921, was only 3 oz., while the increase for the three-day trees, where no change over had taken place, was 12 oz. Similarly, the percentage of the two-day tapping yield obtained by the three-day tapping was 71·3 per cent., against 69·6 per cent. in 1921. In 1923, in every series except one, a drop in yield is noted. The drop in the three-day tapping is greater than in the two-day tapping. The general decrease is due to the exceptionally wet season, while the extra drop in the three-day tapping trees is due to the change over in July, 1923. The remarkable falling off in series 2 calls for special attention. It is in this area that most of the losses from *Fomes* have occurred; several of the trees have shown a marked diminution of yield possibly indicating a diseased condition; it may be necessary for future comparison to exclude this series. In the trees tapped on alternate days 5·8 per cent. of the trees are showing possible symptoms of Brown Bast, against 1·1 per cent. in the trees tapped every three days.

Block 6.

Plot 140 A: ¾ *Acre*.—This plot was under plantains in 1913. In June of that year it was holed by dynamite, 33 feet by 33 feet, and planted with one-year old rubber stumps of a black-seeded variety selected by Mr. T. Petch at Henaratgoda. Vacancies were supplied from the same source. The soil is poor and washed, and early attempts to establish *Tephrosia candida* appear to have largely failed. *Leucæna glauca* was planted later. All interplanted cover crops were cut out in 1919. This rubber has not yet been tapped.

Block 7.

The Hilltop Rubber : 11½ Acres.—This land was cleared of jungle in 1913 and planted in rubber in the same year. Two-year old stumps raised from seed of old trees in the Botanic Gardens were planted in dynamited holes. It is recorded that this method of holing cost 23 cents per hole. The area was divided into three blocks : Block A was planted in clumps of four trees each, 12 feet by 12 feet with 40 feet between the clumps, giving 69 trees to the acre ; block B was planted in avenues, 15 feet by 12 feet with 40 feet between the avenues, giving 112 trees to the acre ; block C was planted 20 feet by 20 feet on the square system, giving 109 trees to the acre.

It should be noted that block A consists of sloping land, block B is almost flat, while block C is steep and rocky. Comparison between the results of the different methods of planting is thus rendered difficult. It is recorded that many rubber plants died during the first dry weather owing to the sinking of the earth in the dynamited holes. Vacancies were regularly supplied. *Tephrosia candida* was sown over the whole area and regularly cut and mulched round the young trees. It is recorded that one cutting of *Tephrosia candida* gave 3 tons of green material per acre. In 1920 the last of the Tephrosia was cut out.

The present rough stone terraces in blocks A and C were built in 1917 ; they have been kept in good repair and form a striking example of the value of this method of soil retention. Tapping was started in April, 1922, when the trees were 9 years old. At the present time there may be said to be three simultaneous and overlapping experiments in progress, viz., (1) Comparison of the three planting methods, (2) single cut *versus* V cut, (3) two-day *versus* three-day tapping. The three planting methods will first be considered : (1) from the point of view of growth as measured by girth and (2) of yield. The average girths in January, 1924, were—

	Inches.
Block A.—Clumps, sloping land ..	33·33
Block B. —Avenues, flat land ..	34·12
Block C. 20 feet by 20 feet, steep land	32·69

The indication is that the lie of the land has exerted more influence than the method of planting. Half of the trees in blocks A and B are tapped with a single cut and half with a V cut, while in block C half are tapped on alternate days and half on every third day. In comparing the methods of planting, therefore, only the yields of trees tapped with a

single cut on alternate days can be considered. The average yield per tree from April, 1922, to December, 1923, for such trees is as follows:—

	Per Tree.	No. of Trees per Acre.	Calculated Yield per Acre.
	lb. oz.		lb. oz.
Block A.—Clumps.. ..	6 2	69	422 10
Block B.—Avenues ..	4 0	112	448 0
Block C.—20 feet by 20 feet ..	4 15	109	538 3

The yield per acre from the trees planted in clumps, though smallest is somewhat striking.

The next experiment is the single cut to the left *versus* the V cut in blocks A and B:—

Single Cut.

Year.	Block A. lb. oz.	Block B. lb. oz.	Average. lb. oz.
1922, April–Dec. ..	2 7	1 12	2 1
1923 ..	3 11	2 4	3 7
Total ..	6 2	4 0	5 8

V Cut.

	Block A. lb. oz.	Block B. lb. oz.	Average. lb. oz.
1922, April–Dec. ..	2 5	1 12	2 0
1923 ..	4 0	2 12	3 6
Total ..	6 5	4 8	5 6

152 trees are tapped on each system.

The result so far indicates no particular advantage for the V cut. A similar conclusion was indicated from the result of the experiment already described in plots 80 and 81 carried out in 1914.

New Two-day versus *Three-day Tapping Experiments.*—Block C is divided into three series for this purpose. Series 1, 3, and 5 (marked with white bands) are tapped on alternate days; series 2, 4, and 6 (marked with black bands) on every third day. In this experiment the cuts on the trees tapped on alternate days were started at 24 inches from the ground, and those on the trees tapped every third day at 16 inches from the ground.

The results to date are given below:—

Year.	Two-day Tapping. Series 1. lb.	oz.	Series 3. lb.	oz.	Series 5. lb.	oz.	Average. lb.	oz.
1922, April–Dec...	2	2	2	3	1	13	2	1
1923 ..	3	0	3	2	2	10	2	15
Total ..	5	2	5	5	4	7	5	0

Year.	Three-day Tapping. Series 2. lb.	oz.	Series 4. lb.	oz.	Series 6. lb.	oz.	Average. lb.	oz.	Percentage of Two-day Tapping. Per Cent.
1922, April–Dec. ..	1	10	1	9	1	9	1	9	75·7
1923 ..	2	10	2	4	2	10	2	8	85·1
Total ..	4	4	3	13	4	3	4	1	81 1

It will be noted that the percentages in the last column are considerably higher than those found in the old two *versus* three-day tapping experiment in plots 151–154. This is partly accounted for by the fact that in 1923, owing to the accidental distribution of wet days, the trees tapped every three days received 116 tappings in the case of the Hilltop rubber and 112 in the case of plots 151–154, while the trees tapped on alternate days received 173 tappings in each case. Unless otherwise stated all trees in the Hilltop experiments are tapped with a single cut to the left, at an angle of 16°, at 24 inches from the ground. The trees selected for tapping are in all cases within narrow limits of girth dimensions.

Block 8.

The Hillside Rubber; 7½ Acres.—This steep and rocky land was cleared and planted at the same time and in the same manner as block C of the Hilltop rubber. Subsequent early treatment was identical. Here also the stone terraces are doing good service. The experiment in progress is a comparison of tapping on alternate days throughout the year, and tapping daily (1) in the months of January, March, May, July, September, and November; (2) in the remaining months. Tapping started in April, 1922, the method being as described for the Hilltop experiments. The trees selected for tapping

are divided into 6 series, two series being tapped by each of the methods described. The results to the end of 1923 are given below:—

Alternate Day Tapping.

Year.	Series 1. lb. oz.	Series 6. lb. oz.	Average. lb. oz.
1922, June–Dec. ..	1 14	1 14	1 14
1923 ..	3 8	3 0	3 4
Total ..	5 6	4 14	5 2

Daily Tapping: January, March, May, July, September, November.

	Series 2. lb. oz.	Series 4. lb. oz.	Average. lb. oz.
1922, June–Dec. ..	1 13	2 0	1 14
1923 ..	3 0	3 3	3 2
Total ..	4 13	5 3	5 0

Daily Tapping: February, April, June, August, October, and December.

	Series 3. lb. oz.	Series 5. lb. oz.	Average. lb. oz.
1922, June Dec. ..	1 15	1 15	1 15
1923 ..	2 14	3 0	2 15
Total ..	4 13	4 15	4 14

Although tapping was commenced on April 7, 1922, the yields for that year are only shown from June, giving four tapping months for each of the daily tapped series.

The trees selected for tapping were within narrow limits of girth measurement. The yield is slightly in favour of alternate day tapping. Moreover, a census of trees showing symptoms of Brown Bast taken in December, 1923, revealed the following facts:—Among the trees tapped daily 16 positive cases of Brown Bast were found and 17 further trees had gone dry. Including the latter trees, 13 per cent. of the daily tapped trees were affected, against 4 per cent. of the trees tapped on alternate days. The conclusion of previous experiments on similar lines was that it was immaterial whether the trees were tapped on alternate days throughout the year or daily

in alternate months. Brown Bast did not then enter into the question, but seems likely in the present case to prove an important factor.

Diseases.

The rubber on the Experiment Station has been, on the whole, remarkably free from disease. The attack of *Fomes lignosus* in plots 151–154 has been the only serious trouble encountered in recent years. Extensive trenching has been resorted to in those plots. Except in the Hillside rubber, Brown Bast has up to date been almost a negligible quantity, and no systematic treatment has been undertaken. A method of isolating the affected area by means of deep cuts to the wood as recently practised in Java is to be tried in the Hillside rubber. Bark rot gave a little trouble during the exceptional season of 1923; in other years the trees have, as a rule, been remarkably free from this disease. Pod and leaf disease has been scarcely seen. A few cases of canker have appeared from time to time.

Manufacture.

Previous to 1922 the rubber was made into biscuits by hand rolling, and dried without smoking; a mouldy product resulted which fetched a very poor price. In 1922, part of an old cacao drying shed was converted into a smoke house, and new plain and diamond rollers purchased. A good quality smoked sheet is now produced, while the remaining latex from each separate plot is made into smoked biscuits.

The Castilloa Rubber: Plots 125 to 129.—These trees are now abandoned. Various methods of tapping were tried in the early days of the rubber industry. Two difficulties were encountered, first the bark of the trees proved so hard that it was difficult to find a suitable implement to make the incision; secondly, when an incision was made, the latex would not flow readily. As these difficulties are not encountered to the same extent in Central America, it is believed that a wrong species or variety of tree was imported.

SECTION 3.

CACAO.

As stated in referring to the history of the station, cacao was for many years the crop which occupied the largest cultivated acreage on the station. To-day there are some 39½ acres of cacao, while *Hevea* rubber, planted over 54 acres, occupies the largest acreage.

The condition of the cacao at the time of the purchase of the property by Government has already been mentioned. The cacao areas can be considered as follows :—

(1)—The Old Cacao.
(2)—The " B " Cacao.
(3)—The Nicaraguan Cacao.
(4)—Miscellaneous Small Cacao Plots.

1.—The Old Cacao.

Plots 1–10, Tundu A, 90–96, 98–101, 107–118.—This cacao was growing when the land was taken over by Government ; its exact age cannot be stated.

A varying number of coconut trees still stand in every plot. It has not been found possible to trace any connection between the cacao yields and the number of coconut palms in the individual plots.

The old cacao consists of a large mixture of varieties. Dr. R. H. Lock in Royal Botanic Gardens Circulars, Vol. II., No. 24, classified the varieties found on the station as follows : —

Criollo Varieties.

(1) Nicaragua. | (2) Old Red.

Forastero Varieties.

(1) Cundeamor.
(2) Liso.
(3) Amelonado.
(4) Calabacillo.

Photographs and illustrations of these types are found in the circular quoted.

The planting is very irregular, and Mr. Herbert Wright early pointed out the desirability of establishing areas of evenly planted cacao of a uniform strain for experimental purposes.

Shade.—Before considering manurial and other experiments carried out on cacao, it will be of interest to note Dr. Lock's remarks on the effect of shade on the yield and condition of the old cacao as set out in Royal Botanic Gardens Circulars, Vol. VI., No. 4, of October, 1911, and No. 9 of May, 1912. Dr. Lock was of the opinion that shade had a far greater influence on yield than any manurial treatment. When Government took over the station in 1902 the Albizzia trees had grown into a veritable forest, and in the course of their removal—which was started at once—considerable damage was done to the cacao trees. Following the removal of the Albizzias, the recovery of the cacao from its enfeebled condition was marked by an increase in crop which rose to a maximum in 1905–06 in practically all the plots. In 1904 Padaps

were planted over the whole area at the rate of 300 to 400 per acre. These were allowed to get out of hand and became closely crowded in 1906. The 1906–07 crop was comparatively poor, although it was an excellent year for cacao in Ceylon. During 1907 the majority of the Dadaps were cut down in a part of the area, leaving only 30–40 per acre for shade. The crop in 1907–08 showed a marked increase in the plots from which the Dadaps had been cut out, although generally it was a bad year for cacao in Ceylon. In 1908–09 the crop from the cleared portion was the second best then on record, while that from the uncleared portion was markedly inferior. This latter area, referred to by Dr. Lock as "Group C," consists of the plots on the south-east side of the Totadeniya paddy fields; Dr. Lock remarks in 1912: "In group C the heavy shade once planted was never cleared." Though the fact does not seem to be recorded, the Dadaps in these plots must have been subsequently thinned, since at the present day the number of Dadaps per acre is between 30 and 50, as in the other old plots. In June, 1912, it is recorded that Dadap stumps were planted in most of the experimental plots with a view to replacing the old trees which were to be gradually removed. No such systematic removal of the old trees appears to have been undertaken, but the fact that there are now considerable gaps in the shade, and that, as stated, the number of old Dadaps per acre is generally between 30 and 50, indicates that either a good many of the stumps put in in 1912 failed, or that a number of the old trees must have died out. Probably both occurred; certainly of late years old trees have died out from time to time. Specimens of these, sent to the Mycologist, did not reveal the presence of any specific disease. In 1923 fresh Dadap stumps were planted in all plots where shade was judged to be deficient; though the bark of these stumps was badly damaged by Kalutara snails, the majority have struck well. The present Dadaps therefore consist of (*a*) the survivors of the old trees planted in 1904; (*b*) trees planted in 1912; (*c*) stumps put in to fill gaps in the shade in November and December, 1923. Wherever the shade is for some reason deficient, the condition of the cacao is almost invariably poor.

The Dadaps are now lopped annually, generally in February. The system adopted is to lop off the branches growing vertically upwards and to leave the side branches, unless these are growing into or interfering with a cacao tree. The lopping is done before pruning the cacao, in order that any damage done to the latter may be rectified at the time of pruning. The question of shade will be again referred to in connection with the "B" cacao block.

Manuring and Cultivation.—Analyses of the soils of the cacao plots were taken in 1905, and will be found in Royal Botanic Gardens Circulars, Vol. III., No. 3. Mr. Bruce remarked: "The cacao soils are brown quartzy loams in a fine state of division. The organic matter is very poor, but carries with it a fair supply of nitrogen. In the mineral plant food there is a fair proportion of lime; the magnesia is present in good quantity; the potash in plot 101 is present in comparatively large quantity, plots 98 and 11 in good quantity, while the others have a fair supply, but plots 1 to 3 and 95 have rather a poor supply. The citric soluble potash is low, except in plot 101. The phosphoric acid is generally poor, although in 5, 10, 98, 100, and 111 there is a fair supply; only traces are citric soluble." Mr. Bruce further remarked that acidity was present in all cases, and that the cacao plots were impoverished compared with the tea land.

The first manurial experiments were planned by Mr. Herbert Wright in consultation with Mr. M. Kelway Bamber in 1902, but were not actually started till 1906. Previous to 1902 it was known that plots 1 and 2 had received an unknown quantity of cattle manure; apart from this there is no record of any manurial treatment. The cacao year is taken as from April 1 to March 31. The plots involved in these first experiments, the manures applied, and the yields from 1903 to 1915–16 will be found in Table A. It is to be noted that this table gives yields for three years before the manures were first applied and for four years after the application had ceased. Unless otherwise stated, the method of application was to scatter the manures in a circle of varying size round the trees and lightly fork them in with mamoty forks. At the beginning of the experiments the more soluble manures were generally applied in three portions in January or February, May, and August; but from 1907 onwards the whole was applied at one time, usually in February.

The assumption that 1,300 pods go to one hundredweight of dry cacao was based on observations made on the Experiment Station in 1907 by Mr. F. D. Tudhope.

The progress and results of the experiments to date were exhaustively reviewed by Dr. Lock in Royal Botanic Gardens Circulars, V. I. VI., No. 4, of October, 1911. Dr. Lock remarked that the differences of crops which could be attributed to the action of definite chemical constituents were extremely slight, and it seemed clear that the continued application of most artificial manures to a cacao soil like that of Peradeniya appeared a waste of money under the conditions of the experiments. A definite value appeared to be attached to the use of bone dust and fish manure, and their use seemed profitable.

Superphosphate appeared beneficial, but not so basic slag. Ammonium sulphate probably caused an increased yield at first, but the relative improvement was not maintained with successive applications. There was no direct evidence that the application of any other form of manure lead to profit. Dr. Lock concluded that once the soil had been got into a good condition and contained ample plant food, further manuring was wasteful. Forking in dry weather was also considered to be harmful through injury to surface roots and increase of evaporation caused by removal of the mulch of leaves. Dr. Lock further pointed out that the varying proportion of the different varieties of cacao in the individual plots rendered direct comparison difficult. He recommended that the application of the manures be discontinued, but that the separate gathering of the crops should be continued. He advocated that all forking and burial of leaves should be discontinued as tending to destroy the mulch of leaves. Cattle manure as a surface mulch was recommended; if artificials were to be applied they should be applied to the surface and just covered over, disturbing the roots as little as possible.

In 1911 the Committee of Agricultural Experiments decided to discontinue these manurial experiments. No more manuring was done till 1916, though the crops from the different plots were still harvested and recorded separately. The results after this period without manure were reviewed by Messrs. Kelway Bamber and D. S. Corlett in Bulletin No. 26. The following notes contain the substance of their remarks:—

Sulphate of ammonia gave the highest yield during application, but the effect was not lasting. Fish manure was effective at first, but the yield fell off when manuring ceased. Soluble phosphates had more effect than bone dust. The stand-out feature was the permanent beneficial effect of castor cake.

The yields of this period without manure have been included in Table A.

A new series of experiments was planned in 1915 and started in 1916–17. Practically all the old cacao plots, both those previously manured and those unmanured, were included in the new experiments, and were grouped together with regard to their previous treatment. The plots were organized into three series of 11 acres each, the same mixtures being given to each series. The plots in series 1 and series 3 had been previously manured; the new mixtures in these were applied annually. The plots in series 2 were not previously manured; the manures in this case were applied once in

every two years as being more in accordance with estate practice. The details of the manures given and the yields from 1916–17 to 1922–23 will be found in Table B. In that table both the permanent numbers of the plots and the numbers given them for the purposes of this experiment are given. Unless otherwise stated the manures were applied in the same manner as in the original experiments.

In May, 1921, after some discussion by the Estates Products Committee of the Board of Agriculture, it was decided that the information being obtained from these experiments was not sufficiently conclusive to justify their continuance. The manures were not applied after that year. The yields of the plots are still being kept separately, and these have been included in Table B up to 1922–23.

Apart from the mixture of cacao varieties in all the old plots, the unevenness of the planting and the variation in the number of trees per acre renders the plots unsuitable for experimental purposes. At the meeting above mentioned it was further decided that old cacao should be cut out when and where required to make room for other crops; up to the present only about half an acre of plot 117 has been cut out, to make room for a part of the new six-acre coffee field.

In the report for the season 1921–22 Mr. Kelway Bamber drew attention to the variation in the relative positions of the similarly manured plots in each series and to the difficulty of drawing any deductions as to the value of the manures.

In December, 1922, the whole area was deeply forked with vertical forking leaves and any material lying on the surface buried in. In December, 1923, this operation was repeated. Since that date no further cultivation has been undertaken. The total yield per acre of dry cacao (good and black) over the whole of the cacao area was 4·87 cwt. for 1921–22, an exceptional yield for the place; for 1922–23 the yield was 3·6 cwt.; for 1923–24 the yield appears likely to be considerably below that of the previous years—the wet season being largely responsible for this.

Diseases.

Cacao Canker.—This disease has been the most prevalent of all diseases associated with cultivated crops on the Experiment Station.

In 1902, the year in which the station was taken over by Government, 141,272 good pods and 88,765 fungus pods were collected. After treatment, in 1903, 213,389 good pods and 20,805 fungus pods were collected; a substantial improvement.

The first spraying experiments were carried out on a small scale in 1902. The details and results are shown in the following table :—

No. of Experiment.	Mixture used.	When applied.	Percentage Fungus Pods after Spraying. Per Cent.
1 ..	6 lb. copper sulphate, 4 lb. lime, and 45 gallons water	Once per day for 35 days ..	15
2 ..	Do.	.. Once per day for 28 days ..	10
3 ..	Do.	.. Twice per week while crop lasted ..	12
4 ..	Do.	.. Once per week while crop lasted ..	13
5 ..	6 lb. copper sulphate, 2 buckets of mud, and 43 gallons of water	Twice per week while crop lasted ..	15
6 ..	6 lb. copper sulphate, 4 lb. lime, and 45 gallons of water ..	Once per day for 21 days ..	8
7 ..	Control ..	.. Nil ..	29

One cooly sprayed 250 to 300 trees per day, and the total cost was estimated at Re. 1·15 per acre per spraying. Against this the reduction in routine canker work had to be reckoned. Only a common garden syringe was used in these experiments.

In 1903 further experiments were carried out to determine: (*a*) Whether intermittent application of the fungicide was more effective than continuous application; and (*b*) the minimum number of sprayings required to effect a conspicuous reduction in the number of fungus pods.

In these experiments an Invicta sprayer was used, and the expense was considerably reduced. The results are shown below :—

Plot.	Acreage.	No. of Sprayings.	No. of Fungus Pods if unsprayed, as per Control Plot.	Actual No. of Fungus Pods collected.	Increase in Value of Cacao collected.	Cost of Spraying incurred.	Profit or Loss.
					Rs. c.	Rs. c.	Rs. c.
43	5	12 continuous	1,446	296	15 0	17 4	—2 4
44	5	12 intermittent	1,157	321	10 0	17 47	—7 47
34	1	2 once per month	490	203	4 0	2 20	+1 80
35	1	4 twice per month	453	179	3 40	3 34	+1 6
36	—	8 once per week	324	193	1 50	5 87	—4 37

The figures given showed only immediate returns when future advantages were considered spraying was recommended as an excellent means of combatting the disease.

A further series of spraying experiments was started in 1904 and finished in August, 1905. The results are given below:—

Plot.	Acres.	Treatment.	Cost per Acre. Rs. c.	Percentages of Fungus Pods.	Dried Pods.
F	3	Sprayed on 18 dry days in August, September, and October	6 0	1·6	20
C	3	Sprayed on 3 consecutive days in August and once per month in September, October, and November	3 80	1·8	31
D	5	Sprayed on 3 consecutive days in August, and twice per month during September, October, and November	3 88	1·8	18
B	5	Sprayed on 23 dry days during August, September, and October	5 57	1·3	21
E	5	Sprayed on 3 consecutive days in August and once per week (16 times) during crop time	8 50	2·5	23
50	1	Thoroughly treated for canker on stem in February, 1904, and all stems and pods sprayed. Excision of cankered areas not again carried out till the end of the year	15 98	2·5	21
Control —				4 9	32

It is presumed that Bordeaux mixture was employed. During August and September, 1905, the whole cacao area was sprayed at a cost of Rs. 5 to Rs. 6 per acre, but the number of sprayings is not stated.

In Royal Botanic Gardens Circulars, Vol. V., No. 13, Mr. T. Petch makes the following comments on these spraying experiments:—Referring to the spraying on the whole estate in August and September, 1905, at Rs. 5 to Rs. 6 per acre, he remarks that assuming that the whole of the reduction in diseased pods in 1905, compared with 1904, was due to spraying, and accepting Wright's valuation of 75 shillings per cwt. for good cacao and 40 shillings for black cacao, the gain was only 287 shillings against about Rs. 550 spent on spraying.

In 1906 all the cacao was reported to have been sprayed as in previous years, though the cost was not given. The percentage of fungus pods in that year rose to 10·2, probably because of the denser shade. In 1907 all the fruits were sprayed twice in August and September at a total cost of Re. 1·27 per acre. The percentage of diseased pods was 9·6. In 1908 the pods were sprayed again at a cost of 93½ cents per acre. The percentage of diseased pods was 5·0.

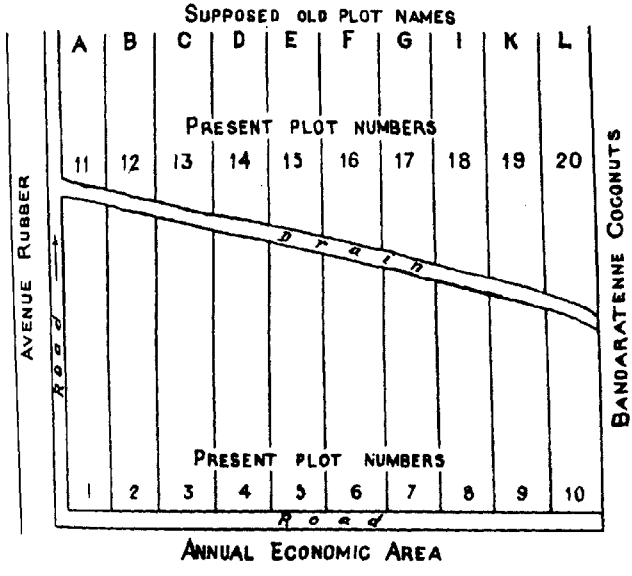
In 1909 spraying was done again at a cost of Re. 1·12 per acre. The percentage of diseased pods was 10·9. The treatment of cacao disease on the Experiment Station has been complicated by many factors. The early removal of shade, excision of diseased tissue, and collection of diseased pods reduced disease to a minimum, even allowing for the favourable weather of 1903–05.

Spraying, though apparently unprofitable, must be given part credit for the low cost of excision work. The operations, however, required more labour than an estate could ordinarily provide when wanted. Spraying in Ceylon should be done in August and September, but these months are frequently so wet that spraying has to be delayed till October, when a large number of pods will already have become diseased. To ensure the fullest possible protection pods should be sprayed once per month from August to November. This, Mr. Petch estimated (in 1910), would cost about Rs. 2·50 per acre. He remarks, however, that even under normal weather conditions this course would generally be impossible.

Spraying appears to have been discontinued after 1910, and reliance placed on the systematic collection and burying of diseased pods together with periodical excision in the case of stem and branch canker. In 1915 a system of scraping cankered bark and rubbing the area with copper sulphate crystals was tried. It achieved a certain measure of success, and was continued periodically till 1923. In that year plots 1 to 10 were treated in the manner described, while clean excision was adopted in the remainder of the cacao. An examination of the trees in plots 1 to 10 made in February, 1924, revealed that out of 82 treated trees examined in no

PLAN 2.

PLAN OF B CACAO PLOTS *4.05 Acres*



case did the disease appear to have spread from the treated area. This scraping method, being considerably cheaper and quicker, is therefore being at present being retained. The situation, both as regards stem and pod canker, after the wet season of 1923, is distinctly bad. At present monthly picking of diseased pods and burial with lime is carried out; funds and labour do not allow of more frequent collection.

(2) The "B" Cacao.

Plots 63–67.—These five acres were cleared of old cacao in 1908 and planted in December of that year with plants grown from seed of a single high yielding Forastero tree in plot 1, known as No. 2 tree. The five acres were divided into ten half acre plots named A to K.

Plots G, H, and K contained steep land and poor soil, the cacao in these plots repeatedly failed, and part of the land was finally planted up with rubber. It now forms the "B Cacao Rubber" block which has been described in Section 2. The remaining plots were utilized for a shading experiment, the details of which are set out in the following table :—

Plot.	Conditions of Shade.	Number of Trees originally planted.	Number remaining.	Percentage of Survivals, of Original Trees in 1912. Per Cent.
A	Low shade, allowed to grow high in June, 1911	100	75	75
B	No shade	120	44	37
C	High shade	153	117	76
D	Do.	145	128	88
E	Low shade	138	111	80
F	Do.	130	74	57

The trees in the unshaded portion were small, weak, stunted, and half the size of the healthy trees in the shaded portions. All plots were eventually shaded. It was early discovered that, though all from the seed of the same tree, the pods borne by these trees showed a considerable divergence of type. Subsequently this question was investigated in detail by the late Mr. H. L. Van Buuren, Assistant to the Economic Botanist, whose death unfortunately prevented full publication of the results of his work.

The trees were kept specially pruned with the object of keeping them low to facilitate picking and other treatment.

Manuring.—A manurial scheme was decided upon in January, 1912, and the first application of the manures, which were to be applied in alternate years, took place in May of that year. Details were as follows :—

No. of Plot.	Treatment.
A ..	Jungle mulch or Dadap loppings.
B ..	10 tons cattle manure forked in.
C ..	200 lb. basic slag buried and trenched with leaves,
D ..	200 lb. ammonium sulphate applied in June and August and disc harrowed.
F ..	200 lb. basic slag, 100 lb. potassium sulphate sown broadcast and disc harrowed.
G ..	200 lb. basic slag, 100 lb. potassium sulphate, and 400 lb. groundnut cake sown broadcast and disc harrowed.
H ..	300 lb. bone dust.
I ..	Control.

The plots K and L previously mentioned in the shading ex periment do not appear to figure in this scheme.

In 1914, at the second application, the method was modified. As the growth of the trees now interfered with disc harrowing, the manures were applied to each tree in a half circle at a distance of 4 feet. The trees were not then all in bearing as is shown by the following table compiled in that year:

Plot.	Good trees.	Supplies.	Vacancies.
A ..	67 ..	13 ..	10
B ..	61 ..	15 ..	12
C ..	66 ..	10 ..	12
D ..	61 ..	10 ..	17
E ..	65 ..	7 ..	16
F ..	67 ..	7 ..	12
Control ..	66 ..	6 ..	12
Last two rows	56 ..	8 ..	18

Separate yields do not appear to have been recorded till 1915, and those yields have not been inserted as there are discrepancies in the naming of the plots, both in the yield table as well as in the table given above.

In the manuring scheme plot I is shown as the control, but in the table showing the number of good trees, &c., the control plot follows F. Also, Bulletin No. 5 mentions "the last four plots G, H, J, and K." In the minutes of the Committee of Agricultural Experiments, which furnish the only record of this first manuring, the plot following H is I, while K is not mentioned. No actual reliable results of the first manuring are, therefore, available, and the details are only given as they may shed some light on the results of the reorganized manuring scheme which started in 1916. Even this depends on the supposition that the old numbers of the plots as shown in plan 2 are correctly applied to the present plots. The new scheme was designed to test the effect of correcting acidity of soil by applications of lime upon the influence of nitrogenous manures. The arrangement of the plots is shown in plan 2; plots 1 and 11, 2 and 12, &c., though divided by a drain, really form continuous plots, and are considered together for yield purposes. The number of trees in the plots differs considerably, and for this reason the yields in Table C have been worked out to 193 trees to the acre. The results to date are rather curious. The applications of sulphate of ammonia and castor cake alone have in each case resulted in a larger yield than applications of the manures with the addition of lime. On the other hand, the application of lime alone, or in conjunction with mulching, has resulted in larger yields than have been obtained from any of the plots receiving manures, except the castor cake plot. As has frequently been found in the old cacao experiments the outside plots are among the best yielding plots.

(3) The Nicaraguan Cacao.

Plots 88, 89, and Tundu B.—Three varieties of this cacao, known for the large size and good quality of the beans, were planted in June, 1904.

In plot 88 four rows were planted 15 feet by 15 feet with plants grown from seed of trees Nos. 53 and 62 in the Botanic Gardens, belonging to the type known as Nicaraguan Criollo type C. This type has a red pod with a rather smooth wall, a wide base, and a short acute point.

In plot 89 four rows were planted from seed of trees Nos. 59, 58, and 63 in the Botanic Gardens, known as Nicaraguan Criollo type A. The pods of this variety are green, turning to yellow when ripe. The pod walls are rough, with a long pointed apex.

Tundu B was planted from seed of trees Nos. 52, 54, 56, and 61 in the Botanic Gardens, known as Nicaraguan Criollo type B. The pods have crimson rough walls, a slightly constricted base, and a long pointed apex.

Some of this Nicaraguan cacao produced fruit at three years old. A sample of Nicaraguan cacao sent to London in 1909 was valued at 105 shillings per cwt., against 85 shillings for Forastero.

The following table gives the yields of these plots calculated to 193 trees to the acre :—

Nicaraguan Cacao.

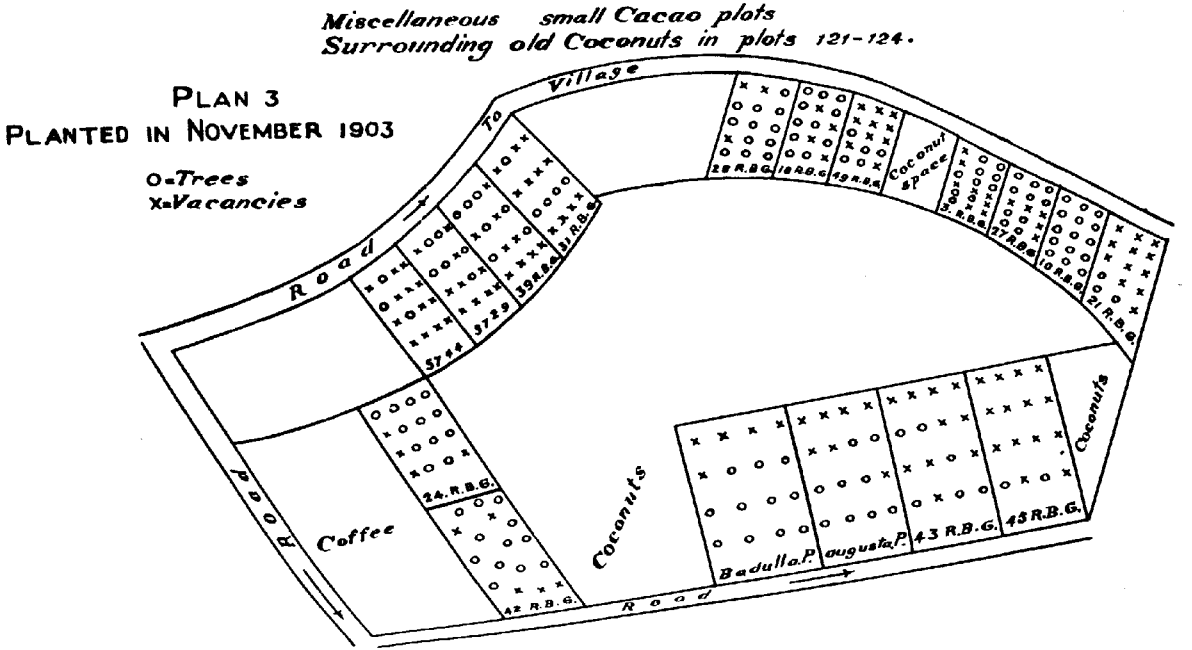
Yields of good pods per Plot from 1907–08 to 1922–23 calculated to 193 Trees per Acre.

Plot.	No. of Trees. 1922–23.	1907–08.	1908–09.	1909–10.	1910–11.
88	176	2,563	506	1,241	1,828
89	87	4,945	2,341	4,261	7,515
Tundu B	97	—	—	517	2,221

	1911–12.	1912–13.	1913–14.	1914–15.	1915–16.
88	1,861	867	1,031	5,307	3,333
89	7,203	4,234	2,117	8,264	5,757
Tundu B	660	1,762	824	5,284	5,863

	1916–17.	1917–18.	1918–19.	1919–20.	1920–21.
88	4,740	2,009	1,089	1,077	1,031
89	7,515	3,974	1,928	3,138	3,134
Tundu B	6,687	4,806	1,102	1,886	2,976

	1921–22.	1922–23.	Average No. of Pods for 16 Years.	Cwt. of cured Cacao.
88	3,709	2,306	2,156	1·7
89	7,270	4,205	4,862	3·7
Tundu B	3,406	1,961	2,854	2·2


Miscellaneous small Cacao plots
Surrounding old Coconuts in plots 121-124.
PLAN 3
PLANTED IN NOVEMBER 1903
O=Trees
X=Vacancies
To Village
Road
Coconut space
Coconuts
Coffee
Coconuts
Badulla.P
ougusta.P
R o a d
29 R.B.G.
19 R.B.G.
49 R.B.G.
27 R.B.G.
19 R.B.G.
21 R.B.G.
31 R.B.G.
39 R.B.G.
37 29
57 44
24. R.B.G.
42 R.B.G.
43 R.B.G.
43 R.B.G.

(4).—Miscellaneous Plots.

Under this heading can be included 140 B and a number of small plots situated round the edges of the block of old coconuts comprising plots 121–124.

Plot 140 B was planted at a date now lost with plants grown from seed of "Porto Cabello" cacao supplied by Mr. Van der Poorten of Galagedara. Only a few trees have, however, produced the typical pods. These pods are red in colour, very broad and short, with a very blunt apex. Plan 3 shows the arrangement of the other plots referred to under this heading, though the size of the cacao plots is exaggerated in relation to the size of the area under old coconuts. These small plots were planted by Mr. Herbert Wright from seed of trees growing in the Botanic Garders, the Experiment Station, and various estates, which were held to be typical of some variety or type or combination of types of cacao. Mr. Wright made drawings and notes of the pods of the parent trees giving full details of their characteristics. Since, however, no detailed critical examination of the characteristics of the pods of the offspring has as yet been made, the inclusion of Mr. Wright's descriptions of the parent trees has not been considered useful. The shade in many of these small plots is deficient, and the cacao in consequence is unhealthy.

Fermentation and Curing.

The earliest curing experiments were carried out by Mr. Herbert Wright starting in 1902, and are described in his book "Theobroma Cacao, or Cocoa." The first experiment mentioned was with the object of effecting a good curing of seeds which had been fermented inside the fruit. In the first experiment the pods were exposed to the sun for seven days until brown and brittle, and the seeds then cured in the sun, some with and some without washing. In the second experiment the pods were kept at a temperature of 100° F. for three days, and subsequently cured in the sun. In a third experiment the seeds were exposed to the sun without any fermenting. The produce obtained from all three methods was unsaleable as good cacao, and had to be included with the "black cacao." Later, Mr. Wright made some observations on temperatures during fermentation as influenced by (*a*) the variety of cacao, (*b*) the quantity of cacao

fermented, (c) the period of fermentation. The following table summaries his results :—

Variety.	Weight of Wet Cacao. lb.	Range in Temperature. °C.	Length of Fermenting Period. Hours.
Caracas	416	25 to 43·3	37½
Caracas	19	26 to 29·4	39
Forastero	543	25 to 44·1	61½
Forastero	307	26 to 32·9	63
Amelonado	203	25 to 40·1	85½
Amelonado	101	26 to 33·5	87
Mixed	250	26·8 to 28·8	39
Mixed	250	26·8 to 30·8	63
Mixed	250	26·8 to 33·7	87
Mixed	300	27·0 to 30·5	39

In all the above cases the larger quantities of cacao were, in the ordinary process of fermentation, subject to a much higher temperature than the smaller quantities, though these differences did not always appear traceable in the appearance of the cured beans. Further details will be found in Mr. Wright's book. The next experiment related to losses during fermentation. The following table gives some of the results obtained :—

		Variety.			
		Caracas.	Forastero.	Amelonado.	Mixed.
Period of fermentation	Hours	37 to 38	61 to 62	85 to 86	39
Range of temperature during fermentation	°C	25·0 to 43·3	25·0 to 44·1	25·0 to 40·1	27·0 to 30·5
Weight of cacao :					
Fresh	lb.	416	543	203	439
Fermented	lb.	384	471	174	392
Loss on fermentation	Per cent.	7·2	13·2	13·3	10·9

Mr. Wright remarked that experiments should be undertaken with much larger quantities before much weight could be attached to the figures.

A further experiment with the same batch of mixed seed showed that the loss increased with the length of fermentation :—

		Batch.		
		A.	B.	C.
Period of fermentation ..	Hours	39	63	87
Range of temperature during fermentation	°C	26·8 to 28·8	26·8 to 30·8	26·8 to 33·7
Weight of cacao :				
Fresh ..	lb.	250	250	250
Fermented ..	lb.	210·10	205·6	197·10
Loss on fermentation ..	Per cent.	15·6	17·8	20·9

Later experiments in curing with or without washing were carried out. The unwashed cacao had a dirty appearance, became mouldy, and finally had to be included in the black cacao for sale. On the other hand, the seeds had a sweet taste, and the weight was greater. Mr. Wright found the following differences in weight between washed and unwashed cacao :—

Caracas	2 per cent. to 7 per cent.
Forastero	½ per cent. to 5 per cent.

In another case a difference of 4 per cent. was found.

The loss in weight in curing after fermentation formed the subject of another experiment. The results were as follows :—

Variety.	Before Fermenting. lb. oz.	After Fermenting. lb. oz.	After Washing. lb. oz.	After Curing. lb. oz.	Total Loss. Per Cent.
Caracas ..	19 0	16 12	15 2	7 10	59
Caracas ..	321 0	294 0	280 0	117 0	63
Forastero ..	307 0	258 6	247 0	118 0	61
Forastero ..	313 0	273 0	255 0	110 0	64
Amelonado ..	101 0	84 8	77 14	39 2	61
Amelonado ..	95 0	81 0	77 0	32 0	66
Mixed ..	439 0	392 0	— ..	163 0	62
Mixed ..	250 0	210 0	200 8	97 0	61
Mixed ..	250 0	205 6	193 8	95 0	62
Mixed ..	250 0	197 10	186 12	94 0	62

A later experiment in claying black cacao with Indian red clay resulted in the cacao thus treated realizing Rs. 42 per cwt., or only Rs. 10 less than the ruling price for best cacao

In 1914 a trial was made of pouring back the "sweatings" over the fermenting cacao, but the cacao so treated realized a depreciated price in the Colombo market.

Later, Mr. D. S. Corlett carried out some experiments in the length of the period of fermentation. The conclusion was that for the Ceylon market 36 hours was the optimum period. Cacao fermented for longer periods fetched depreciated prices in Colombo.

The details of Mr. Corlett's experiments are not available, but a fresh series of experiments on the same basis were started in January, 1924. These experiments are being carried out with the ordinary mixed crop of the station, excluding the Nicaraguan cacao. Each series includes fermentation under varying conditions for periods of approximately 40, 64, and 88 hours. Up to date two series have been completed. Full records of temperatures, &c., are being kept and will be published in due course. The produce is to be sent to England to ascertain the views of manufacturers.

Samples are also being sent to Colombo brokers. So far it may be stated that the shortest period of fermentation only has given a product with the bright external colour desired in the local market.

The normal routine method of fermentation and curing on the Experiment Station has for some years been as follows :—

The wet cacao is placed, about 4 P.M., in cement tanks lined with plantain leaves, and the top covered with plantain leaves. On the following morning about a bucket of water is poured into the tank and the cacao stirred up by trampling. On the next morning between 7 and 8 A.M. it is removed from the tank, well washed in baskets in running water, and spread on coconut matting in the sun to dry. It is thus spread daily till curing is complete. The following modifications have been made since January, 1924. The tanks have been fitted with wooden slat floors to allow for the passage of air under the fermenting cacao. These floors are covered with a piece of coconut matting. The interiors of the cement tanks have been covered with "Skene's wax" to prevent the corrosive action of the acetic acid ; up to the present the application of this preparation appears to have been successful. Plantain leaves being scarce, sacks or leaves of other kinds have been substituted for covering the

cacao. Instead of leaving the cacao out for sun drying during the working hours, it is now only left out for four hours daily in bright sunlight. The Nicaraguan cacao is cured separately, otherwise no attempt is made to separate varieties. A flue drying shed formerly existed for use in wet weather, but the flues having become entirely unserviceable, a part of the building was converted into a rubber smoke house in 1922.

The question of the proper equipment of the Experiment Station including the provision of up-to-date fermenting and curing facilities for cacao formed the subject of a recent report by a Sub-Committee of the Estates Products Committee of the Board of Agriculture.

Miscellaneous.

Investigations by Mr. Tudhope in the number of pods required to furnish a given weight of dry cacao, the weight of a bushel of cacao at various stages, &c., gave the following results: —

		Variety.			Average.
		Caracas.	Forastero.	Amelonado.	
Average weight of a bushel of fresh seeds	lb.	77	77	77	77
Average weight of a bushel of cured seeds	lb.	41	44·5	46·5	44·0
Number of cured seeds in one bushel		14,800	14,900	20,400	16,700
Weight of 500 pods	lb.	573	706	533	606
Weight of fresh seed from 500 pods	lb.	103	130	106	113
Weight of seeds from 500 pods after 10 hours' fermentation	lb.	88·5	106·5	87·5	94
Weight of seeds from 500 pods after curing	lb.	37·5	49·38	39·88	42·25
Number of pods required to yield 100 lb. cured seeds		1,333	1,012	1,253	1,200

[For tables A and B see pages 65 and 66.]

TABLE C.

"B" CACAO.

Manurial Experiments.

Plots 63 67, 4·05 Acres. To determine effect of correcting acidity of soil upon the influence of nitrogenous manures.

Yields per Plot from 1916–17 to 1922–23 calculated to 193 Trees per Acre.

Plot.	No. of Trees, 1922–23.	Treatment.	1916–17.		1917–18.		1918–19.		1919–20.		1920–21.		1921–22.		1922–23.		Average Number of Good Pods.	Average calculated to Cwt.
			Pods.	Cwt.	Pods.	Cwt.	Pods.	Cwt.	Pods.	Cwt.	Pods.	Cwt.	Pods.	Cwt.	Pods.	Cwt.	1916–23.	Cwt.
1 & 11	48	2 tons slaked lime, per acre	668	0·5	4,194	3·2	2,322	2·6	6,135	4·7	4,443	3·4	5,738	4·4	4,246	3·3	4,107	3·2
2 & 12	86	Do.	2,109	1·6	5,174	4·0	3,503	2·7	3,650	2·8	3,076	2·4	5,180	4·0	4,622	3·6	3,902	3·0
3 & 13	79	250 lb. sulphate of ammonia	2,331	1·8	5,093	3·9	3,325	2·6	3,003	2·3	3,323	2·6	5,072	3·9	3,502	2·8	3,677	2·8
4 & 14	83	1,000 lb. castor cake, per acre	3,588	2·8	5,551	4·3	3,984	3·1	3,640	2·8	3,404	2·6	5,298	4·1	3,489	2·7	4,136	3·2
5 & 15	82	Control	2,401	1·8	4,379	3·4	3,173	2·4	3,038	2·3	2,974	2·3	3,271	2·5	2,746	2·1	3,140	2·4
6 & 16	84	2 tons lime and 250 lb. sulphate of ammonia	2,519	1·9	5,213	4·0	3,047	2·3	3,542	2·7	2,752	2·1	4,186	3·2	2,760	2·1	3,431	2·6
7 & 17	84	2 tons lime and 1,000 lb. castor cake	2,604	2·0	6,189	4·8	3,598	2·8	3,358	2·6	3,169	2·4	4,572	3·5	2,854	2·2	3,763	2·9
8 & 18	80	2 tons lime and 151 lb. nitrate of potash	3,051	2·5	5,585	4·3	3,835	2·9	3,648	2·8	2,671	2·1	4,972	3·8	3,323	2·6	3,869	3·0
9 & 19	73	2 tons lime, 250 lb. sulphate of ammonia, and 120 lb. superphosphate, per acre	2,382	1·8	6,942	5·3	3,119	2·4	2,764	2·1	2,847	2·2	3,426	2·6	3,337	2·6	3,545	2·7
10 & 20	82	2 tons lime and mulching with cheddy	3,074	2·4	5,518	4·2	3,800	2·9	3,331	2·6	3,069	2·4	5,087	4·7	4,076	3·1	3,994	3·1

The season is counted as from April 1 to March 31, 1,300 pods = 1 cwt. cured cacao.

ABLE B.

periments, 1916–17 to 1920–22.

ood Pods only.

e.	Yields.														Average Yield of Good Pods, 1916–23.	Average calculated to Cwt.
ate h.	1916–17.		1917–18.		1918–19.		1919–20.		1920–21.		1921–22.		1922–23.			
	Pods.	Cwt.	Pods.	Cwt.	Pods.	Cwt.	Pods.	Cwt.	Pods.	Cwt.	Pods.	Cwt.	Pods.	Cwt.		
	8,467	6·5	4,599	3·5	5,055	4·7	3,761	2·9	4,686	3·6	5,437	4·1	3,143	2·4	5,021	3·9
	8,839	6·8	3,834	2·9	3,953	3·0	3,842	3·0	4,011	3·1	4,951	3·8	3,754	2·9	4,740	3·6
	7,398	5·7	3,194	2·5	4,250	3·3	3,047	2·3	4,590	3·5	4,256	3·3	3,093	2.4	4,261	3·3
	6,871	5·3	3,366	2·6	5,573	4·3	3,409	2·6	4,966	3·8	4,443	3·4	2,523	1·9	4,450	3·4
	9,427	7·3	3,555	2·7	4,082	3·1	4,536	3·5	4,822	3·7	4,765	3·7	3,757	2·9	4,992	3·8
	5,208	4·0	3,433	2·6	3,372	2·6	3,053	2·3	4,137	3·2	4,922	3·8	3,820	2·9	3,992	3·1
	7,164	5·5	3,017	2·3	4,359	3·4	4,769	3·7	4,350	3·3	4,292	3·3	1,909	1·5	4,265	3·3
	7,166	5·5	6,170	4·7	6,121	4·7	5,023	3·9	5,605	4·3	7,056	5·4	3,694	2·8	5,833	4.5
	6,253	4·8	5,214	4·0	4,350	3·3	5,145	4·0	3,975	3·1	6,056	4·7	3,380	2·6	4,910	3·8

8,624	6·6	6,890	5·3	3,701	2·8	4,105	3·2	6,103	4·7	7,764	6·0	6,035	4·6	6,174	4·7
7,871	6·1	5,813	4·5	5,193	4·0	5,387	4·1	5,728	4·4	8,267	6·4	5,581	4·3	6,262	4·8
7,480	5·8	4,569	3·5	4,494	3·3	3,813	2·9	4,160	3·2	6,483	5·0	4,471	3·4	5,067	3·9
5,975	4·6	5,294	4·1	5,240	4·0	4,992	3·8	4,505	3·5	6,915	5·3	4,391	3·4	5,331	4·1
9,000	6·9	6,688	5·1	3,934	3·0	5,313	4·1	4,493	3·5	7,548	5·8	3,879	3·0	5,836	4·5
9,181	7·1	7,331	5·6	6,330	4·9	3,303	2·5	4,270	3·3	7,961	6·1	2,818	2·2	5,884	4·5
9,403	7·2	6,302	4·8	3,512	2·7	2,429	2·0	2,716	2·1	3,545	2·7	2,659	2·0	4,509	3·5
8,987	6·9	5,972	4·6	6,056	4·7	4,380	3·4	5,338	4·1	5,988	4·6	5,146	4·0	5,981	4·6
9,235	7·1	6,452	5·0	6,746	5·2	5,237	4·0	6,001	4·6	6,782	5·2	6,636	5·1	6,726	5·2
4,075	3·1	3,842	3·0	3,471	2·7	3,312	2·5	3,834	2·9	4,982	3·8	2,715	2·1	3,747	2·9
4,486	3·5	3,789	2·9	4,632	3·6	4,171	3·2	5,343	4·1	5,331	4·1	2,860	2·2	4,373	3·4
6,819	5·2	4,620	3·6	2,963	2·3	2,575	2·0	3,516	2·7	5,569	4·3	3,428	2·6	4,212	3·2
6,655	5·1	4,078	3·1	2,792	2·1	2,737	2·1	3,473	2·7	5,544	4·3	3,580	2·8	4,122	3·2
8,263	6·4	6,122	4·7	3,620	2·8	2,350	1·8	4,328	3·3	7,437	5·7	4,481	3·4	5,228	4·0
7,949	6·1	5,998	4·6	4,098	3·2	5,677	4·4	4,186	3·2	6,926	5·3	4,972	3·8	5,686	4·4
7,054	5·4	4,691	3·6	3,751	2·9	3,958	3·0	4,682	3·6	6,376	4·9	4,339	3·3	4,978	3·8
3,632	2·8	3,543	2·7	3,111	2·4	2,867	2·2	3,722	2·9	4,681	3·6	3,137	2·4	3,527	2·7
9,487	7·3	7,050	5·4	5,539	4·3	4,093	3·1	4,430	3·4	8,394	6·5	4,180	3·2	6,167	4·7
5,378	4·1	4,621	3·6	4,396	3·4	2,612	2·0	3,79)	2·9	5,345	4·1	2,294	1·7	4,062	3·1
6,903	5·3	5,515	4·2	4,717	3·6	3,050	2·3	3,982	3·1	6,951	5·3	3,799	2·9	4,988	3·8
3,204	2·5	3,108	2·4	2,205	1·7	2,792	2·1	3,514	2·7	3,411	2·6	2,907	2·2	3,020	2·3
6,577	5·1	4,341	3·3	5,142	4·0	3,670	2·8	4,626	3·6	5,410	4·2	4,020	3·1	4,826	3·7

r acre over the whole period is 2·8 cwt.

SECTION 4.

COFFEE.

Robusta Types.

ROBUSTA.—This coffee is found on the following plots :–

Plot 140 E.—Planted in May, 1910, and shaded with *Leucæna glauca.* The plot was originally planted 8 feet by 8 feet, but alternate bushes were subsequently removed. In December, 1921, it was divided into three sub-plots, and a small experiment in cultivation and manuring commenced :—

140 E (1) receives 9,000 lb. of cattle manure forked in with vertical forking.
140 E (2) receives a heavy mulch of green material (usually Dadap leaves), but no cultivation.
140 E (3) receives plain forking.

The treatment was omitted in 1922, but resumed in 1923.

In June, 1922, the bushes were cut down to 1 foot from the ground, and one selected sucker allowed to grow up to form the new bush. At the time of writing the bushes have not fully resumed bearing, so that results of this treatment are not yet available. A manurial experiment was carried out in this plot in 1915, which is dealt with under manuring.

140 F.—Planted 6 feet by 6 feet in June, 1914, and shaded with Dadap.

140 G.—Planted in November, 1913, and shaded with *Leucæna glauca.* The plot was originally planted 8 feet by 8 feet, but alternate bushes were removed in 1920.

Part of Plot 140 K (end further from store).—Planted 10 feet by 10 feet in June, 1915, and shaded with Dadaps.

Three Rows in Plot 140 M.—Planted 8 feet by 8 feet in November, 1918, and shaded with *Leucæna glauca.*

Two Rows in Plot 140 N.—Planted 10 feet by 10 feet in July, 1918, and shaded with *Gliricidia maculata.*

Plot E 85.—Planted 8 feet by 8 feet in June, 1921, and shaded with *Leucæna glauca.*

Two Rows in Bandaratenne Rubber.—Planted 10 feet by 10 feet in October, 1921 (no shade except the rubber).

CANEPHORA : Plot 140 L.—Planted 10 feet by 10 feet in June, 1915, and shaded with Dadaps.

Five Rows in Plot 140 M.—Planted 8 feet by 8 feet in November, 1918, and shaded with *Leucæna glauca.*

One Row in Plot 140 N.—Planted 10 feet by 10 feet in July, 1918, and shaded with *Gliricidia maculata.*

Plot E 86.—Planted 8 feet by 8 feet in July, 1921, and shaded with *Leucæna glauca.*

Two Rows in Bandaratenne Rubber.—Planted 10 feet by 10 feet in October, 1921 (no shade except the rubber).

UGANDA: Plot 140 J.—Planted 10 feet by 10 feet in January, 1915, and shaded with Dadaps. (The north-eastern end of this plot is planted with Hybrid.)

Three Rows in Plot 140 M.—Planted 8 feet by 8 feet in November, 1918, and shaded with *Leucæna glauca.*

One Row in Plot 140 N.—Planted 10 feet by 10 feet in July, 1918, and shaded with *Gliricidia maculata.*

Two Bushes in Plot 140 H. (coffee round Show Plots).—These are immediately outside the office door, and are grown without shade.

Plot E 87.—Planted 8 feet by 8 feet in July, 1921, and shaded with *Leucæna glauca.*

Two Rows in Bandaratenne Rubber.—Planted 10 feet by 10 feet in October, 1921 (no shade except the rubber).

QUILLOU: Plot 140 K.—Planted 10 feet by 10 feet in June, 1915, and shaded with Dadaps. (The north-eastern end of this plot is planted with Robusta.)

Three Rows in Plot 140 M.—Planted 8 feet by 8 feet in November, 1918, and shaded with *Leucæna glauca.*

One Row in Plot 140 N.—Planted 10 feet by 10 feet in July, 1918, and shaded with *Gliricidia maculata.*

Plot E 88.—Planted 8 feet by 8 feet in July, and shaded with *Leucæna glauca.*

Two Rows in Bandaratenne Rubber.—Planted 10 feet by 10 feet in October, 1921 (no shade except the rubber).

HYBRID: Part of Plot 140 J.—Planted 8 feet by 8 feet in July, 1903, without shade. In 1915 all bushes were cut down to one foot from the ground. Two stems were subsequently allowed to grow up from each stump.

Plot 140 H (coffee round Show Plots).—Planted in June, 1903, and therefore the oldest coffee on the station. It is unshaded.

Plot E 89.—Planted 8 feet by 8 feet in July, 1921, and shaded with *Leucæna glauca.*

Two Rows in Bandaratenne Rubber.—Planted 10 feet by 10 feet in October, 1921 (no shade except the rubber).

LAURENTII: One Row in Plot 140 M.—Planted 8 feet by 8 feet in November, 1918, and shaded with *Leucæna glauca*. This coffee is believed to be identical with Robusta.

The Robusta Types.—Information on the cultivation of these coffees will be found in Department of Agriculture Leaflet No. 23. The main characteristics distinguishing these coffees from the Arabian or Liberian coffees are easily seen. The growth is far more vigorous than the Arabian, the leaves are crinkled, generally bent at the midrib and droop downwards. The leaves are larger than those of Arabian, but considerably smaller than the leaves of Liberian; and of a lighter colour.

Great variations are, however, found in the individual Robusta types. Moreover, the points of difference between these types are neither easy to distinguish nor consistently maintained. Differences recorded in Java are not in every case visible at Peradeniya. Taking the Robusta as the standard of comparison, the following points have been noted :—

Canephora.—Growth somewhat more vigorous, and berries rather larger. Crop matures rather earlier. The immature berries are of a bronze colour instead of light green as in Robusta.

Uganda.—The leaves appear slightly flatter and less crinkled.

Quillou.—This coffee is sometimes considered as a variety of Canephora. It is said to be less liable to variation than Robusta. The leaves are much more crinkled and bent at the midrib. The young leaves are brownish instead of light green. The ripe berry is light red or vermilion, while the ripe Robusta berry is dark red. The crop matures earlier than Robusta.

Hybrid.—This coffee most nearly resembles the Robusta types and has been included among them. The seed was sent by Messrs. Leboeuf of Paris in 1903. The exact nature of this coffee is not known. It was sent as a "hybrid," but that was probably merely the collector's name for a species he did not recognize. It is improbable that the seed was obtained by hybridization. The fact that the young berries show the bronze colour described for Canephora also indicates its origin. The leaves are smaller and more crinkled than any other of the Robusta types. The yield is heavy.

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LIBERIAN TYPES.

EXCELSA : Two Rows in Plot 140 M.—Planted 8 feet by 8 feet in November, 1918, and shaded with *Leucæna glauca.*

One Row in Plot 140 N.—Planted in July, 1918, and shaded with *Gliricidia maculata.*

Plot E 95.—Planted 8 feet by 8 feet in October, 1923, and shaded with *Leucæna glauca.*

ABEOKUTA : Two Rows in Plot 140 M.—Planted 8 feet by 8 feet in November, 1918, and shaded with *Leucæna glauca.*

One Row in Plot 140 N.—Planted 10 feet by 10 feet in July, 1918, and shaded with *Gliricidia maculata.*

E 94.—Planted 8 feet by 8 feet in October, 1923, and shaded with *Leucæna glauca.*

LIBERIA PASIR POGOR: Two Rows in Plot 140 M.—Planted 8 feet by 8 feet in November, 1918, and shaded with *Leucæna glauca.*

One Row in Plot 140 N.—Planted 10 feet by 10 feet in July, 1918, and shaded with *Gliricidia maculata.*

Plot E 96.—Planted 8 feet by 8 feet in October, 1923, and shaded with *Leucæna glauca.*

COFFEA ARNOLDIANA : Plot 140 O.—Transplanted from plot 140 P, 8 feet by 8 feet in November, 1922, and shaded with *Gliricidia maculata.* Only three plants have survived.

COFFEA KLAINII : Plot 140 O.—Planted 8 feet by 8 feet in June, 1922, and shaded with *Gliricidia maculata.* Fourteen plants have survived.

COFFEA ARUWIMIENSIS : Plot 140 P.—Planted 10 feet by 10 feet in June, 1922, and shaded with Dadaps. Seven plants have survived.

Liberian Types.—The Liberian coffees are easily distinguished from the Robusta. The leaves are much larger and of a darker colour, and the young leaves have a brownish or coppery hue. The branches and leaves have a tendency to grow upwards instead of drooping. The berries, which are much larger, have a thicker skin and a larger proportion of pulp; and fewer berries are found in a cluster. The Excelsa, Abeokuta, and Liberia Pasir Pogor coffees came into full bearing in 1922–23 at the age of four years. The yield of fresh berries per tree for that year were as follows :—

	lb.
Excelsa	10·09
Abeokuta	3·78
Liberia Pasir Pogor	4·53

100 lb. of berries of these coffees will only give about 10 lb. of commercial coffee.

The growth of the Excelsa is exceptionally vigorous and healthy.

The Arnoldiana, Klainii, and Aruwimensis coffees, of which seed was obtained from the Belgian Congo in February, 1921, are not yet in bearing.

The Liberian types appear distinctly less liable to dieback than the Robusta types. They are rather more prone to leaf disease, but do not suffer any great damage. There is very little interest taken in Liberian coffees in Ceylon at the present time, and the produce is difficult to dispose of locally.

Arabian Types.

COFFEA ARABICA: Plot 140 F.—Planted 10 feet by 10 feet in November, 1914, and shaded with Dadaps.

Plot E 90.—Planted 8 feet by 8 feet originally in July, 1921. Great difficulty was experienced in establishing the plots, and almost all the present plants are later supplies. The plot is shaded with *Leucæna glauca.*

JACKSON'S HYBRID: South-western Half of the Six-acre Coffee Field.—Planted 8 feet by 8 feet with one additional plant in quincunx in October, 1922, and shaded with *Gliricidia maculata.* Additional *Leucæna glauca* shade was planted in December, 1923. Contour hedges of *Indigofera arrecta* were sown in June, 1923.

KENT'S ARABICA: North-eastern Half of Six-acre Coffee Field.—Planting, &c., as described under Jackson's hybrid.

Arabian Types.—*Coffea arabica* in plot 140 F is at present in very poor health. It has suffered severely from leaf disease and dieback. Probably the shade is insufficient.

The yield in 1922–23 was 1 lb. of fresh berries per tree. The difficulty in establishing this coffee in plot E 90 has been mentioned.

Jackson's Hybrid and Kent's Arabica.—Since these two coffees were planted at the same time in the six-acre coffee field, they can be conveniently dealt with together. The exact nature of hybrid is not known. The seed was obtained from H. Jackson, Esq., of Dabarri, Pooli Betta, Coorg, South India, in January, 1922. At the same time seed of Kent's Arabica was obtained from L. P. Kent, Esq., Doddengooda, Mudigeri, Kadur District, Mysore.

Kent's Arabica is not a hybrid, but a vigorous strain of old Mysore Arabica. Mr. Kent claims that it is practically immune from leaf disease. As sufficient warning of the arrival of the seed had not been received, the clearing, draining, and preparation of the land and the planting of shade was not commenced till the seed was sown in the nurseries. Gliricidia cuttings were planted in September, 1922, and the young coffee plants were uprooted from the nurseries with the transplanting tool and planted out in October, 1922. The young plants were thus only shaded with jungle branches. This lack of shade may be a contributory cause to the later partial failure of these coffees. The young plants of both varieties did well at first, and in January, 1923, only 5 per cent. of each variety had failed. In June, 1923, contour hedges of *Indigofera arrecta* were sown, and in the same month all the nursery plants available were planted to supply vacancies. Leaf disease and scale insects made their appearance during 1923, and casualties were numerous.

Other Types.

MARAGOGIPE COFFEE: Plot E 92.—Seed at stake planted 8 feet by 8 feet in April, 1922. There are many vacancies, and the plot is not fully established. The shade is *Leucæna glauca*.

Marogogipe Coffee is said to bear large berries of good quality, but to be a poor yielder. The few plants in plot E 92 are not yet in bearing.

Pests.

The Green Bug (*Coccus viridis*) is found at times on all varieties, particularly when the bushes are in poor health.

The Coffee Borer (*Zeuzera coffeæ*) has been only very occasionally found.

Bats have been observed to feed on the sweet pulp of the berries, subsequently dropping the seed.

The Kalutara Snail feeds on the rind of the berries and also destroys the blossom.

Diseases.

Rust or leaf disease (*Hemileia vastatrix*) attacks all the Robusta coffees to a slight extent, but no serious damage results.

"*Dieback.*"—This is by far the most serious trouble encountered. The condition is usually ascribed to physiological causes. No effective remedy has so far been devised. A census taken in 1921 showed that 75 to 82 per cent. of the bushes of Robusta, Canephora, Uganda, and Quillou were affected, but only 42 per cent. of the Hybrid bushes. Spraying with Bordeaux mixture to check dieback was systematically carried out in plot 140 G in 1921 with no beneficial results. In 1922 an experiment in the partial removal of the young berries to check dieback was carried out in plot 140 N; the result was negative.

Manuring.

A manurial experiment on four-year old Robusta coffee was carried out in 1915 in plot 140 E. Details are given below:—

No. of Plot.	Manures applied.	No. of Bushes.	Pounds Fresh Berries per Plot. 1915–16.	Pounds Fresh Berries per Bush. 1915–16.
1	Steamed bone meal 14½ oz. per tree; sulphate of potash 5½ oz. per tree. (Nitrogen omitted)	46	125½	2·73
2	Groundnut cake 31¼ oz. per tree; nitrate of potash 9¼ oz. per tree. (Phosphoric acid omitted)	45	93¼	2·18
3	Groundnut cake 39¼ oz. per tree; steamed bone meal 14½ oz. per tree. (Potash omitted)	39	101	2·59
4	Sulphate of ammonia 11¼ oz. per tree; concentrated superphosphate 7½ oz. per tree; nitrate of potash 9¼ oz. per tree. (Complete mineral mixture)	33	67½	2·04
5	Groundnut cake 25¼ oz. per tree; steamed bone meal 14½ oz. per tree; nitrate of potash 9¼ oz. per tree. (Complete organic mixture)	35	46	1·31
6	Control	27	40¼	1·49

Separate yield records for these plots in the succeeding years do not appear, so that the result cannot be taken as final.

Records show that the Hybrid coffee in plot 140 H (round Show Plots) was manured with both artificial and cattle manure in 1913, and that in plot 140 J with artificials in 1916. The Robusta in 140 F received basic slag in 1916. Artificials were applied to the Robusta in 140 G in 1915-16. In 1916 basic slag and lime were applied in varying quantities to Uganda in plot 140 J, to Quillou in 140 K, and to Canephora in 140 L. From 1916 to January, 1922, there are no records of any manures being applied to coffee. The shade trees were regularly lopped during this period, and the loppings mulched round the bushes. Plot 140 N (adjoining the store) has received periodical applications of various leafy and other refuse. In 1920 it appears that all plots were forked. In January, 1922, all the plots included under plot 140 received an application of 4 lb. per tree of a mixture consisting of two parts of castor cake to one part of ashes (partly from burnt coconut husks and partly from burnt weeds), forked in all over the plots with vertical forking.

The result of this application appears in the remarkable increase in yields in 1922-23.

Plots E 85, E 86, E 87, E 88, and E 89 received cattle manure at the rate of two baskets per bush lightly forked in October, 1923.

Yields.

Owing to the small size and irregularity of the coffee plots, yields are considered in pounds of fresh berries per tree. The station has at present no facilities for pulping and curing coffee. The crop season for the Robusta types is from October to February. The Hybrid coffee bears almost all the year round. The yields for four years are given below :—

Variety.	Pounds Fresh Berries per Bush.			
	1919-20.	1920-21.	1921-22.	1922-23.
Robusta ..	1·34	1·37	1·83	3·99
Canephora ..	1·87	1·57	1·95	4·88
Uganda ..	2·06	2·26	2·05	5·47
Quillou ..	2·81	1·17	2·31	4·98
Hybrid ..	—	1·21	5·41	10·73

100 lb. of fresh berries will give 21 to 22 lb. of parchment coffee and about 50 lb. of sun-dried coffee.

SECTION 5.

COCONUTS.

The coconut areas of the Experiment Station can be dealt with as follows :—

(1)—The Old Coconuts.

(2)—The Bandaratenne Coconuts ; Plots 53–62.

(3)—Coconut Varieties in Fodder Grass Plots.

(4)—Miscellaneous.

(1)—The Old Coconuts.

Under this heading the following areas are included :—

(*a*) Plots 103–106.

(*b*) Plots 121–124 (excluding small patches of cacao).

(*c*) An area lying between (*b*) and the present Assistant Manager's bungalow.

(*d*) The coconuts scattered throughout the old cacao plots, and in the jungle between the village of Iriyagama and the Assistant Manager's bungalow.

It will appear that the only systematic experiments were carried out in areas (*b*) and (*c*) above, with the addition of a piece of land then planted in coconuts, but now forming part of the Panchikawatte paddy fields.

The experiments in question were designed by Messrs. Bamber and Vanderstraaten in 1909 and started in 1911. The trees which were irregularly planted were divided up into 15 plots containing 35 trees each. No plan showing the method of dividing up the area now exists.

The trees were described as probably 50 years old. The objects of the experiment were to determine whether trees of about 50 years old would respond to cultivation and manuring, and if so the best form of cultivation and manure to apply and the best method of application. The treatment of the plots and the yields for the years 1911 to 1914 are shown in the following table :—

Yields from Old Coconut Manurial Experiments, 1911 to 1914.

No. of Plots.	Treatment of Plot.	1911.		1912.		1913.		1914.		Average Number of Nuts per Tree per Annum, 1911–1914.	
		Mature Nuts.	Immature Nuts.	Mature Nuts.	Immature Nuts.	Mature Nuts.	Immature Nuts.	Mature Nuts.	Immature Nuts.	Mature Nuts.	Immature Nuts.
1	250 lb. commonsalt per plot applied in rings 10 to 12 feet from trees. Soil in ring forked	1,885	1,623	1,323	1,802	9,996	1,787	1,230	1,457	38·8	47·6
2	100 lb. sulphate of potash	866	1,144	1,181	1,279	1,003	1,285	1,143	1,121	29·9	34·5
3	75 lb. nitrate of soda and 75 lb. sulphate of ammonia	576	808	628	970	531	1,287	920	1,189	19·5	31·3
4	100 lb. concentrated superphosphate of lime ..	850	732	917	982	949	1,262	1,481	1,050	30·0	28·7
5	200 lb. crushed fish, 200 lb. basic slag, 100 lb. kainit	1,074	1,192	1,149	1,606	1,281	1,910	1,974	1,447	39·1	44·0
6	100 lb. basic slag, 100 lb. kainit, and a mulch of 100 lb. green material ..	988	1,020	1,324	1,184	1,149	1,415	1,888	1,206	39·3	35·5
7	Same manures as 6. Jungle material mulched as in plot 6 after failure of *Mimosa pudica*	931	949	1,372	1,244	1,038	1,589	1,766	1,368	36·5	36·8
8	Ploughing twice annually	1,022	1,270	1,477	1,994	1,524	2,248	1,981	1,715	42·9	51·6
9	25 lb. nitrate of soda, 18 lb. sulphate of ammonia, 16 lb. concentrated superphosphate, 66 lb. kainit. Total 125 lb. applied every two months (?) ..	816	1,001	891	1,419	1,163	2,167	1,812	1,870	33·4	46·1
10	150 lb. lime	910	1,213	1,007	1,427	865	1,763	1,153	1,467	28·1	41·9
11	250 lb. basic slag and 250 lb. kainit. Dadap loppings carried and dug in round trees after the failure of *Tephrosia purpurea* seed	796	1,031	1,067	1,306	736	1,719	1,050	1,326	27·6	40·8
12	Cattle tied in a ring round the trees and a ring afterwards dug round the trees. No cattle tied after 1913 and no cultivation done ..	784	1,254	1,348	1,585	1,324	1,587	1,632	1,282	36·3	40·8
13	Cattle tied for two weeks four times a year. Soil not dug	559	1,506	1,132	2,035	1,384	2,547	1,542	1,843	33·0	56·6
14	Unmanured	1,072	1,153	815	1,475	872	1,524	1,388	1,285	29·6	38·8
15	Do.	840	1,391	881	1,492	743	1,676	1,215	1,492	26·3	43·2

The following deductions were made from the experiment :—

(1) Ploughing twice a year was, at all events for the time, as beneficial as manuring.
(2) Tying cattle appeared to have an immediate effect.
(3) The soluble mixture applied to plot 9 produced a steady increase of crop.
(4) Green manure with basic slag and sulphate of potash produced a steady increase.
(5) Common salt exerted no beneficial effect; the yield of the plot, in fact, steadily declined.

The average number of nuts required to make a candy of copra was 1,660, but varied from 1,258 on plot 7 to 1,980 on plot 8. The manures in plot 9 are variously stated as having been applied (1) once in two months, (2) once in three months, (3) twice a year; the actual procedure followed is uncertain. No other experiments of importance seem to have been undertaken among the old coconuts. The total number of old coconuts on the station in December, 1921, was 1,863. The yield for 1921 was 25·7 nuts per palm; for 1922, 25·7 nuts; and for 1923, 25·2 nuts.

(2.)—The Bandaratenne Coconuts: Plots 53–62.

This area was under young cacao, which was uprooted in 1907. The land was then holed for coconuts and planted 25 feet by 25 feet with plants from selected seed nuts from Goluapokuna estate, Negombo. Cotton, tobacco, groundnuts, maize, and other dry grains were sown as catch crops in 1908. In 1909, after ploughing and discing, all the flat portion was sown with gingelly and sunflower. In the same year some soil wash experiments were carried out in the steep portion; these will be described in Section 8, Green Manures. In 1910 and 1911 drains were opened on the steep portion and *Tephrosia candida* sown. The first nuts appeared in 1913.

In 1912 certain of the plots were let out to villagers for growing chena crops and vegetables; the system was found unsatisfactory and was soon abandoned. The first attack of the black beetle is recorded in 1913. Beetle traps were established in that year. In the same year the flat portion is reported to have been cleared of illuk, mimosa, &c., and the young palms forked round. Regular cultivation by ploughing and disc harrowing appears to have been continued up to 1920. Clean weeding was practised for 6 feet round the trees.

A manurial experiment was started in 1916, but, partly no doubt on account of the small number of palms involved, the results appeared so inconsistent that the experiment was discontinued in 1918, after which year no manures have been applied.

In 1920 the arrangement of the drains was reorganized; the area was divided up into rectangular blocks to facilitate the use of implements. Though this object has been achieved, the drainage is not satisfactory. In 1920 the whole of the steep portion of the area was completely overgrown with illuk. Since that year a great deal of labour has been annually expended in forking out this weed: progress has been made, but its complete eradication will take at least another two years. The remaining growth has been clean weeded once a year. The final intention is to plant up this portion with contour hedges of some suitable leguminous plant. In the flat portion the growth of grass is periodically ploughed in, while the disc harrow is sometimes used in dry weather. No experiment is now in progress. The number of vacancies supplied during the early stages is indicated by the fact that in 1922, 15 years after the original planting, out of a total of 764 trees, only 373 were in bearing. In 1923, 460 were in bearing. The yield per palm in bearing was 25 nuts in 1922 and 19 nuts in 1923.

(3.)—Coconut Varieties in Fodder Grass Plots: Plots 156–160.

By arrangement with Gate Mudaliyar A. E. Rajapakse, nuts of 19 varieties have been received from Alexandra estate, Ja-ela, for comparative trial.

The first consignment of 37 nuts arrived in February, 1921. Drawings and records of the characteristics of these nuts have been retained at the Head Office of the Department before passing the nuts to the Experiment Station for planting.

Further consignments of nuts have arrived periodically, and after germinating in nursery beds have been planted out in the above plots. The varieties are numbered 1 to 19.

The intention is to establish 20 trees of each variety. The growth of these nuts has not been satisfactory in the early stages, and many vacancies have been supplied. To fill up a vacant ¼ acre, 20 plants of Java coconuts (to be mentioned later) have been planted in February, 1924. The young plants were mulched round with cattle manure at the time of the manuring of the grass plots.

(4) Miscellaneous.

(1) *The Dwarf Coconuts.*—In October, 1920, 100 nuts of a dwarf variety were received from Sungei Nipan estate, Port Dickson, Negri Sembilan, Federated Malay States.

The nuts were planted in nurseries; 76 nuts germinated. These were planted out in holes, 25 feet by 25 feet, in a strip of Guinea grass lying between the road and the river opposite the Assistant Manager's bungalow in October, 1921. The area is low lying, and the plants did not make satisfactory growth.

In October, 1923, only 42 trees were making good growth, the remaining 34 had either died or were in a moribund condition. The young trees were completely submerged by floods in 1923.

(2) *The Java Coconuts.*—Two seed nuts introduced from Java in 1905 were planted in the extreme western corner of plot 106 (old coconuts).

These palms yield nuts of a very much larger size than the ordinary Ceylon nut. The following comparative figures for the Java nuts and ordinary Ceylon nuts from the Experiment Station give an indication of the qualities of the Java nuts, though the figures are taken from an examination of four nuts only :—

	Java.	Ceylon.
	lb. oz.	lb. oz.
Weight of husk per nut ..	1 14 ..	2 0
Water ..	3 4 ..	1 7
Kernel ..	2 1 ..	0 12
Shell ..	0 10 ..	0 6
Thickness of kernel ..	7 16th inch ..	½ inch
Estimated number of nuts per candy of copra ..	896 ..	1,378

It must be borne in mind that the Ceylon nuts taken for comparison are from old, mostly uncultivated, trees on the Experiment Station and not representative of the best estate nuts. As stated a block of 20 plants grown from nuts of the two original trees have been established in fodder grass plot No. 156. In February, 1924, the young plants in this plot were mulched round with cattle manure during the manuring of the grass plots.

A certain number of nuts from these Java palms have been supplied to the public for planting purposes from time to time.

(3) *Position of Planting Experiment.*—In August, 1920, 36 Java nuts were planted in nursery beds in the following positions :—12 nuts horizontal, 12 nuts vertical, 12 nuts slanting at an angle of 45°.

The germination was : horizontal 6, vertical 10, and slanting 11. The plants from the germinated nuts were, in October, 1923, planted in plot 161 B among Guinea grass, with a view to comparing the subsequent growth and form of the trees.

SECTION 6.

PADDY.

Two areas are devoted to paddy cultivation :—(1) The Totadeniya paddy fields (plan 4); (2) the Panchikawatte paddy fields (plan 5), adjoining which is a block of small plots used for nurseries.

Work has consisted mainly in trial of new varieties, experiments in transplanting and reduction of seed rate, irrigation and drainage, seed selection, the introduction of green manure crops, and a few minor manurial trials. The area under paddy is small, the land all terraced, and therefore unsuitable for extensive manurial experiments.

The Totadeniya Paddy Fields.

These fields existed as paddy fields before the acquisition of the land by Government.

Irrigation and Drainage.—In 1915 a method known as the canal and drain system was introduced (see plan 4). The essentials of the system were that water should be supplied from a canal direct to every plot and should be drained away into a deep, central drain direct from every plot, instead of being carried from plot to plot as is usual in village cultivation. In the early stages of the crop water was kept in the fields for three days at a time, and in the later stages for ten days at a time. The advantages of the system were that the water to be applied to any one plot could be easily and completely controlled, and as a result soil aeration, which is lacking when water is kept continuously in a plot, could be easily effected. After the introduction of this system a yield of 77 bushels per acre was obtained from these fields, against a yield of 33 bushels per acre previously obtained under village conditions of irrigation.

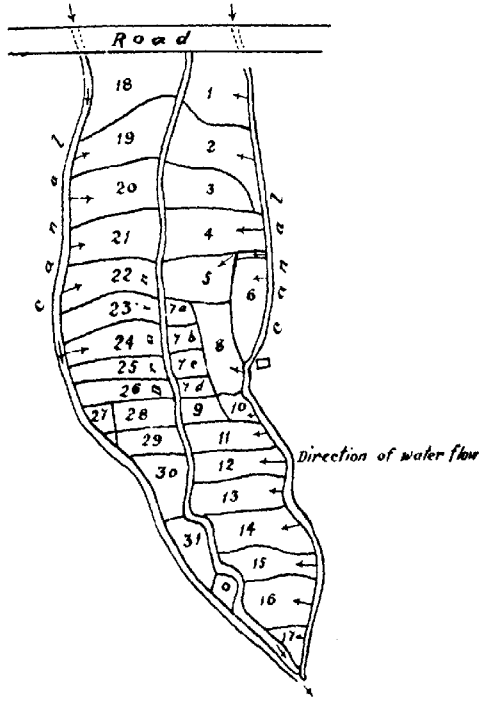
The amount of water used by this method was according to rough computation about 50 inches for a five-month crop including rainfall.

PLAN 4

ROUGH SKETCH OF

TOTADENIYA PADDY FIELDS

BELOW ROAD



Transplanting.—In 1916 transplanting trials resulted in the conclusion that one-quarter of a bushel of seed paddy thinly sown in a nursery provided sufficient seedlings for planting out one acre of paddy, and that the yield from an acre of paddy thus planted would probably be greater than that from an acre of paddy broadcasted with the usual seed rate of two bushels per acre.

Green Manures.—A considerable number of green manures were tried from time to time in these fields, but it cannot be said that any great success was obtained. The wetness and presence of springs in parts of the fields probably militates against the successful germination and growth of such plants. *Sesbania aculeata* (Daincha) has probably been the plant most successfully employed, but the amount of green material afforded is not large.

Trials of new Varieties.—The following tables give details and results of trials carried out in the Totadeniya fields from 1916 to 1919 :—

Results of Paddy Experiments, 1916.

Name of Variety.	Date of Flowering.	Date harvested.	Calculated Yield per Acre. Bushels.
Date of Sowing: July 22 and 24, 1916. Date of Transplanting: September 4 to 8, 1916.			
Dr. Lock's selected No. 1 quality	Nov. 15, 1916	Feb. 12 & 13, 1917	11 (*a*) 44 (*b*)
Dr. Lock's selected No. 2 quality	Nov. 18, 1916	Feb. 12 & 13, 1917	18
Molagusamba	Dec. 1, 1916	Jan. 27, 1917	25
Mulan Ay Manilla	Oct. 15, 1916	Dec. 18, 1916	13
Senora Manilla	Oct. 25, 1916	do.	19
Macan Pina Manilla	do.	Dec. 22, 1916	30
Fino rice	do.	Jan. 15, 1917	12
Ein el bint	do.	do.	5½
Philippine	do.	Feb. 22, 1917	—
Yamani, Yabani	Flowered in nurseries when 43 days old.		

Before sowing the above paddies two crops of green manures, including *Crotalaria striata*, *Crotalaria juncea*, horse gram, long beans, cow peas, *Sesbania aegyptiaca*, and *Sesbania aculeata* were grown and ploughed in. The growth of these plants was reported to be poor. In addition, the plot sown with Dr. Lock's selected No. 1 quality paddy received lime at the rate of 1 ton per acre, which was ploughed in with the green material.

Results of Paddy Experiments, 1917.

Name of Variety.	Date of Sowing.	Date of Transplanting.	Date of Flowering.	Date of Harvesting.	Age. Months.	Calculated Yield per Acre.
Muttusamba	Sept. 3, 1917	Oct. 10, 1917	Jan. 9, 1918	Mar. 27, 1918	6	20 bushels
Molagusamba	Aug. 20, 1917	Oct. 8, 1917	Dec. 23, 1917	Feb. 12, 1918	6	30 bushels 5 measures
Swarnawari	Aug. 29, 1917	Oct. 11, 1917	Oct. 25, 1917	Dec. 15, 1917	4	½ bushel
Mada El	do.	Oct. 13, 1917	Nov. 25, 1917	Feb. 11, 1918	6	15 bushels 5½ measures
Philippine	Aug. 28, 1917	Oct. 15, 1917	Jan. 14, 1918	Mar. 9, 1918	6	20 bushels
Mulan Ay Manilla	do.	do.	Nov. 24, 1917	Feb. 28, 1918	6	15 do.
Kaharaimana	do.	Oct. 16, 1917	Dec. 23, 1917	Mar. 1, 1918	6	10 do.
Ein el hut	Aug. 29, 1917	Oct. 17, 1917	Dec. 5, 1917	Mar. 2, 1918	6	32 bushels 1 measure
Fino	do.	Oct. 16, 1917	Dec. 18, 1917	Mar. 1, 1918	6	5 do.
Macan Pina Manilla	do.	Oct. 15, 1917	Dec. 5, 1917	Feb. 12, 1918	6	12 bushels
Dr. Lock's Hatiel	do.	Oct. 9, 1917	Dec. 15, 1917	Mar. 9, 1918	6	31 bushels 5 measures
Handiram	do.	Oct. 13, 1917	Nov. 24, 1917	Jan. 21, 1918	4	10 bushels
Hatiel (village)	do.	Oct. 11, 1917	Jan. 9, 1918	Mar. 19, 1918	6	48 do.
Sudaisamba	do.	Oct. 10, 1917	Jan. 5, 1918	Mar. 8, 1918	6	30 do.

It is obvious from the results that many of the varieties were not suited to the district.

Results of Paddy Experiments, 1918.

Name of Variety.	Date of Sowing.	Date of Transplanting.	Date of Flowering.	Date of Harvesting.	Yield calculated to the Acre. Bushels.
Hatiel ..	Sept. 4, 1918 ..	Nov. 7, 1918 ..	Jan. 15, 1919 ..	Mar. 17, 1919 ..	53
Muttusamba ..	Sept. 2, 1918 ..	Nov. 5, 1918 ..	do. ..	Mar. 14, 1919 ..	45¾
Molagusamba ..	do. ..	Nov. 11, 1918 ..	Jan. 3, 1919 ..	Feb. 25, 1919 ..	43¾
Philippine ..	Sept. 4, 1918 ..	Nov. 4, 1918 ..	Jan. 10, 1919 ..	Mar. 7, 1919 ..	24½
Dr. Lock's Hatiel ..	Sept. 2, 1918 ..	Nov. 6, 1918 ..	Dec. 20, 1918 ..	Mar. 12, 1919 ..	15¼

Results of Paddy Experiments, 1919.

Plot.	Name of Variety.	Acreage sown.	Date of Growing in Nursery.	Date of Transplanting.	Date when Paddy in Flower.	When harvested.	Yield calculated to the Acre. Bushels.
1 ..	**Molagusamba** ..	¼ acre ..	Oct. 7, 1918..	Nov. 11, 1918..	Jan. 3, 1919..	Feb. 24, 1919..	48
2 ..	Do. ..	do. ..	do. ..	Nov. 12, 1918..	do. ..	do. ..	56
3 ..	Do. ..	do. ..	do. ..	Nov. 13, 1918..	do. ..	do. ..	72

Water allowed four days on and three days off.

Water was drained off ten days before harvesting.

From 1921 inclusive, this area, exclusive of the portion above the road which crosses these fields, has been utilized by the Economic Botanist for yala cultivation in his pure line selection work.

The Panchikawatte Fields.

The land now occupied by these fields was under coconuts in the early days of the station. Subsequently some of the land was cleared and utilized for annual crops.

In 1919, 2½ acres in the northern corner of the area was planted with tea, of which 2 acres was cut out again in 1920 to form the present paddy fields. The remaining ½ acre forms the present ½-acre tea plot.

The conversion of the whole area into terraced paddy fields was completed in November, 1920, and a number of the plots were sown with paddies of different varieties in the same maha season (1920–21).

The results were as follows :—

Variety.	Calculated Yield per Acre.
	Bushels.
Village Hatiel	63¾
Muttusamba	56¼
Dr. Lock's Hatiel	46½
Hill Paddy (under irrigation) ..	36¾
Indrasail	24¾
Macan Pina	20¼
Gizasamba	5¾

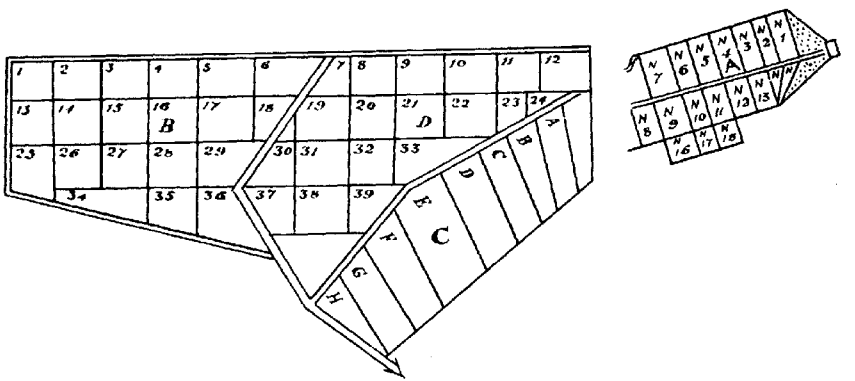
The failure of the Gizasamba was largely due to the presence of springs in those plots.

All varieties were grown in nurseries and transplanted. Another variety, Jeerakasamba, failed in the nursery. All the new plots showed a marked inferiority of growth on the upper sides, where the surface soil had been removed to a considerable depth for levelling. This unevenness has gradually diminished with continuous cultivation and treatment. The plots not cultivated with paddy in that season were sown with Indigofera.

PLAN 5

ROUGH SKETCH OF THE

PANCHIKAWATTE PADDY FIELDS



In April, 1921, two varieties of paddy from the Northern Province, murangan and illankallayan, were tried in plots B, C, and D. Both varieties were in this instance practically a failure.

The majority of the plots were sown in 1921 with green manures, including *Cassia hirsuta, Crotalaria juncea, Indigofera arrecta*, green gram, cicer gram, cow peas, black gram, and *Crotalaria usaramoensis*. Very poor growth was obtained.

Drainage.—Many of the plots in block D proved very swampy on account of the presence of springs, and in July, 1921, an attempt was made to tile drain plots 21 and 33 with pipe lines made of half round tiles laid together to form a rough continuous cylinder. The method was at first very successful, and was extended in August to other plots. The cost of a single line of this form of pipe was estimated at $2\frac{1}{2}$ cents to 3 cents per foot. Subsequently the tiles collapsed, and the system became ineffective. The high price asked by local makers for making cylindrical tile pipes led to the attempt to employ half round tiles for the purpose.

Manurial Trials.—In the maha season 1922–23 six plots were utilized in the trial of a new mineral phosphate from Tonkin on hatiel paddy. Plots 19 and 31 were treated with Tonkin phosphate at the rate of 240 lb. per acre. Plots 20 and 32 with a similar application of bone meal, while plots 7 and 8 were left as control. The yield both of grain and straw from the control plots was considerably in excess of that of either of the manured plots. The trial has been repeated in the maha season 1923–24.

From the maha season 1921–22 inclusive, the block marked as B on the plan has been utilized by the Economic Botanist for maha cultivation in his pure line selection work.

Many of the plots in block D are swampy and unsuited for paddy cultivation. Though not swampy, equally poor results have been obtained in block C, and the conversion of both these blocks to some other use is at present contemplated.

The supply of water for these fields is drawn partly from a tank above the nursery area and partly by utilizing the drainage water from the tea land. The supply is not sufficient for the whole of the present area, and, in seasons of short rainfall, occasions considerable difficulty.

Hill Paddy.—3·6 acres of land which now forms the annual economic area were broadcasted with hill paddy in August, 1920. The yields (without irrigation) was $27\frac{1}{2}$ bushels per acre.

Work of the Economic Botanist.

The following account has been furnished by Mr. R. O. Iliffe, Economic Botanist :—

Maha Season, 1919–20.

Before the arrival of the Economic Botanist, a collection of paddy varieties of the Colony was made by the Director of Agriculture in September, 1919. These were to be grown at the two experiment stations at Anuradhapura and Peradeniya. As the former was considered the more important as a paddy centre, the bulk of the samples was sent there ; and duplicates, when available, were sown at Peradeniya. The main object of the paddy experiments detailed below may be briefly stated to be the extraction, fixation, and multiplication of pure line strains of local paddies for increase of yield ; the seed from improved strains to be distributed to the neighbourhood of origin for extensive cultivation.

The paddies were sorted under three main age-divisions, viz., 6 months and over, 4–5 months, less than 4 months. They will be described under these heads.

Sixty-eight samples of 6 months' varieties were broadcasted in nurseries on the Totadeniya fields in October, 1919, and transplanted in duplicate beds of 4 feet by 50 feet a month later. At the same time, 266 varieties of 4–5 months' paddy were also sown and transplanted, but there was sufficient space for one plot only of each. The Economic Botanist, on arrival, found the majority of these paddies in flower, and it was at once noticed that, in their new habitat, the paddies had changed their period of growth, and nearly all came to maturity in 4–5 months. The crop, as a whole, was not successful. There had been some difficulty in irrigation, and it was noticed that the plants near the central drain were most successful, whereas those on the outside of the fields (*i.e.*, near the feed channel) failed almost entirely.

With the press of work and large number of varieties on hand at the two stations, the Economic Botanist could only secure 37 of the 6 months' group and 19 of the 4–5 months' group for future work. These were harvested, sorted, described, and packeted.

Yala Season, 1920.

A collection of short age paddies was received later than the original batch. In April, 44 of these, maturing in 3 months, were sown at Totadeniya, and transplanted in May. Tiller counts were recorded, and selections were made for yala, 1921, if they could be included. Twenty-four were found to be good, and 20 gave only moderate returns.

Another batch of 41, maturing in 2–4 months, was sown at Totadeniya in May. This material again showed a grading according to the position in the fields, and the results were used for a paper on "The Tillering of Ceylon Rices," published in the "Tropical Agriculturist," February, 1921.

Maha Season, 1920–21.

The work on the long age paddies at Anuradhapura had been conducted in far greater detail than at Peradeniya, and as the samples were duplicated at the two stations, material was brought from Anuradhapura for this sowing. It was decided to confine attention to those paddies which could conveniently be classed as ma-wi and samba, as these proved the most popular. Under ma-wi were included mahama-wi, suduma-wi, kalukan-ma-wi, kuruma-wi, godama-wi, rathkundarna-wi, ratuma-wi, kohuma-wi, &c., and under samba, podi-wi, kurulutudu-wi, ratnasamba, Japane-wi, muthumannikan, &c. Each plant had been uprooted separately, examined, and packeted, and it was easy to establish pure line selections. After a suitable number had been allocated to Anuradhapura, the remainder was brought to Peradeniya. In September, 1920, 179 pure line nurseries of ma-wi strains and 44 samba strains were sown at Totadeniya, each seed being sown separately at intervals of 2 inches by 2 inches. These were transplanted at intervals of 9 inches by 9 inches about 6 weeks later. A certain amount of selection was done, and the material was packeted and kept.

Yala Season, 1921.

On April 27, 238 pure line selections, from the previous yala harvest, were sown in nurseries at Totadeniya. They were constituted as follows: bala-wi 18 lines, dahanala 20 lines, ilankalayan 7 lines, murungan 48 lines, heenati 142 lines. The seedlings were transplanted at intervals of 9 inches by 9 inches in beds 9 feet across a month later.

Five highland fields were sown on June 6 with paddies from India and Burma, supplied by the Ceylon Agricultural Society. The varietal names were sadai samba (Coimbatore); indrasail (Dacca); kataktara (Dacca); ngasein (Burma); ngachima (Burma). Reference to these paddies will be found in the Ag. Op., India, 1919–20. As the samples were received late, they could only be sown on fields rejected from the ma-wi series sowings, and the crop was so poor that no records were taken.

A pernicious deposit of iron accounted for the failure of much of the paddy during this season. The sluices of new cement showed no stain, and the iron is probably contained in the fields themselves.

Maha Season, 1921–22.

For this season, the new Panchikawatta fields (blocks A and B) were used. Twenty-six ma-wi and six samba selections were sown in nurseries in block A on September 1, 1921. Owing to

the newness of the fields, and the irregularities of soil exposed in terracing, it was decided not to attempt strict comparative trials, and as many strains as possible were included to test for suitability to the district. Prolonged drought prevented the preparations of the main fields for transplanting to date, and the nursery block at Totadeniya was ploughed up as an emergency measure to perpetuate the seed. There was never enough water to flood the nurseries, and only just sufficient to keep the field drains full. When rain came, the fields in block B were prepared, and transplanting began on October 28, 58 days after sowing. Conditions throughout the season were as bad as they could be, and tillering was profuse in the nurseries. In all, 87 plots of standard dimensions, 4½ feet by 40½ feet, were transplanted with seedlings, spaced 6 inches by 6 inches, by means of special wooden guide poles, used for the first time. Harvest began on March 13, 1922. The season was interesting, as it showed that reasonable crops of paddy could be grown with very little water. To conserve available water, and to minimize future shortage, the drainage water from the adjoining tea slope was tapped by a dam and sluice gate.

Yala Season, 1922.

The selections for yala, 1921, were divided into 2 series, according to their age performance. The first batch of 18 selections (maturing in 150–159 days) was sown on March 26, and the second batch of 49 selections (maturing in 110–139 days) was sown on April 25/26. Transplanting took place a month later in each case in standard plots of 4 feet by 20 feet. Three repetitions of each line were made. An outbreak of *Piricularia oryzæ* seriously affected the nurseries of series 2, and it was difficult to secure healthy seedlings to fill the transplant beds. The whole of series 2, which was put down in the lower fields, was submerged later by the flooding of the river, and ripening was much delayed. Enough seed was harvested for trials in the following year, and the season was probably the most successful since the fields were taken over.

On April 12 a collection of eight paddies reputed to withstand the effects of brackish water were also sown in some of the poorer fields for extracting pure lines.

On May 24 block C and fields 12 and 24 of block D of the Panchikawatta area were sown down with five varieties of hill paddy. The plants grew away sturdily at first, but became choked with weeds later, and hardly any seed was harvested.

Maha Season, 1922–23.

A repetition of last maha season's work was laid down on block B of the Panchikawatta area. The same 32 lines were sown in September 2 and transplanted on September 25 in

plots of 4 feet by 20 feet to test consistency of performance. Six repetitions of each were transplanted, six plots of unselected local hatiel were put in for comparison. The season was much more successful than the previous one, and some good yields were taken. The drainage water for the tea proved ample for the block.

From the growing crop of hatiel in maha, 1921–22, some selections were made for pure lines. These were sown in a nursery block on September 3, each seed being dropped through a hole in a board to form blocks of 100 seeds at intervals of 3 inches by 3 inches.

Thirty-one hill paddies were broadcasted in block on September 16. The same experience as before was met with. These fields, with the exception of Nos. 7, 8, 19, 20, 31, 32, which were used by the Manager, Experiment Station, for manurial trial, are unsuited to dry land paddy, and there is insufficient water to grow irrigated paddy on more than block B.

Yala Season, 1923.

The same 18 selections of series 1 were sown at Totadeniya on March 26, and transplanted with four repetitions a month later in beds of 4 feet by 20 feet at 6 inches intervals. Only 37 selections of series 2 were found worthy of retrial, and these were sown in April 25 and transplanted on May 21. Five repetitions of each were put down. The season was good and produced some promising results.

A collection of 12 selected paddies from British Guiana and 8 locally procured varieties were sown in small plots on June 5. They were received too late for inclusion in the main sowings, and were caught by the floods two days later. A further trial will have to be made.

At Panchikawatta, a soil error test was started, and bala-wi paddy was broadcasted on block B on June 9. The seed was carefully weighed out to sow evenly over each plot, and was harvested in strips 4 feet wide on October 3 *et seq.* The results are not yet finally worked out.

Maha Season, 1923–24.

At Panchikawatta the number of paddies under trial was reduced, so that more repetitions could be made. Eleven ma-wi and four samba selections were sown on September 15 and transplanted to give thirteen repetitions of each. Plots of local hatiel were intercalated.

At Totadeniya selections were made from the brackish paddies grown in the previous season, and 85 plots of 100 seedlings each were laid down by means of the sowing board on November 20–23. Heavy rain followed on November 22, 24, and 28, but sufficient material remained for selection work.

SECTION 7.

FODDER GRASSES.

Plots 156, 157, 158, 159, 160, 161, 162.—These plots stretch along the banks of the Mahaweli-ganga from the cacao plot, named Tundu B, to the acute bend of the river opposite the School of Tropical Agriculture and the Central Seed Store. The plots are interplanted with coconuts, details of which will be found in the coconut section. Starting from Tundu B the following plots are found :—

Plot 162. ½ *Acre.*—This plot, which was under cassava, was planted with roots of *Paspalum dilatatum* obtained from the Hakgala Botanic Gardens in June, 1921, and following months. Later, owing to confusion with another grass, the grass was named *Paspalum dilatatum A*. It has proved one of the most successful of the grasses under trial, giving at the end of two years the second largest yield, and easily the largest number of food units per acre.

Plot 161 (*2*).—This plot is planted with Guinea grass which is not included in the trials. It also contains coconuts under "position of planting" experiment (see Coconut Section).

Plot 161. ½ *Acre.*—The plot was under Cassava in December, 1920, and in January, 1921, was planted up with a grass obtained from the Royal Botanic Gardens, and at that time known as *Paspalum virgatum*. It has since been identified at Kew, however, as a variety of *Paspalum dilatatum*, and is now known as *Paspalum dilatatum B*. The grass has grown well and is well liked by cattle, but stands comparatively low as regards yield and number of food units per acre.

Plot 156.—This plot was planted in July, 1920, with a grass then called Elephant grass, but since identified at Kew as a variety of *Panicum maximum*, and named Guinea grass A. It is a coarse, vigorous grass, well eaten by stock if cut sufficiently young, but rejected if allowed to grow too old. It has given the largest yield in two successive years.

Plot 157.—This plot was planted up with the ordinary Guinea grass (*Panicum maximum*) in December, 1923. The grass is now named Guinea grass B.

It is one of the best grasses, and after two years' trial stands second only to *Paspalum dilatatum A*. in number of food units per acre.

Plot 158.—Starting in December, 1920, Bermuda grass (*Cynodon dactylon*) and Kikuyu grass (*Pennisetum clandestinum*) were in turn tried in this plot. The former was rejected on account of its small yield and the latter because, owing to its creeping habit, it was found impossible to keep it free from sensitive weed and other foreign growth. Napier's grass (*Penniselum typhoideum*) was planted from cuttings during the latter part of 1923, and promises well in yield. On analysis the feeding value of the first sample sent was reported poor, but a later sample was found to be of better nutritive value than any of the other grasses.

Plot 159, 1 Acre.—This plot was planted with Water grass (*Panicum muticum*) in December, 1923, but became so mixed with sensitive weed and other foreign growth that it was decided to uproot the grass and substitute another. This will be done in 1924.

Plot 160, 1 Acre.—This plot was cleared from a mixed growth of cheddy and Illuk grass in December, 1920, and early in 1921 was planted half in Natal Red Top grass (*Tricholæna rosea*) and half with Rhodes grass (*Chloris gayana*). In June, 1921, it was decided that Natal grass showed no promise as a fodder grass, and the whole plot was planted up with Rhodes grass. There is still a mixture of Natal grass which can easily be distinguished by its light hairy flower. Rhodes grass has proved the least successful of the grasses still included in the trials. The yield is poor. The lower half of this plot is very sandy, and the fodder grass has throughout had to contend with a vigorous growth of couch and illuk.

The following table gives the yields and feeding values of the grass at present included in the trials for the first two years :—

	1921-22.		1922-23.		Average of Two Years.	
	Yield. Tons per Acre.	No. of Food Units per Acre.	Yield. Tons per Acre.	No. of Food Units per Acre.	Yield. Tons per Acre.	No. of Food Units per Acre.
Guinea grass A.	40·8	580	34·8	494	37·8	537
Guinea grass B.	39·4	752	26·5	505	32·9	627
Water grass	33·2	541	—	—	—	—
Paspalum dilatatum B.	27·8	470	21·5	365	24·6	416
Rhodes grass	29·2	326	15·9	226	19·4	276
Paspalum dilatatum A.	22·7	647	34·1	958	28·4	809

SECTION 8.

GREEN MANURES.

The only area permanently assigned to the growth of green manure plants consists of the "Show Plots" lying between the office and the store. In these plots as representative as possible a collection of green manures is maintained for the inspection of visitors. In this section will be found a brief description of the green manure plants at present grown on the station. Some analyses of green manures will be found at the end of the section.

1.—The Tree Forms.

Erythrina lithosperma.

The Dadap.—This tree is too well known to require description. The results obtained in the tea plots have been fully described in Section 1, and its use as a cacao shade tree in Section 3. Another variety, *Erythrina velutina*, was introduced by Mr. M. Kelway Bamber in 1920.[1] Seedlings were planted out in November, 1920, in the piece of vacant land between plot 150 and the paddy nurseries. The plants made vigorous growth, but being thorny are not likely to find general favour. The leaves are of a lighter colour than the common Dadap, and the growth is more bushy.

Gliricidia maculata.

This tree may be seen in the following plots:—140 N; 140 O; half-acre tea plot, 164; Hillside tea; New Avenue rubber, 165; six-acre coffee field, E 97–E 102. A record of the weight of green material furnished from loppings of these trees in comparison with Dadaps has been given in Section 1. An examination of the root systems of the trees showed that, in the specimens examined, the formation of nodules was, at the time of inspection, more prolific in the Gliricidia, though the nodules were rather smaller. At Peradeniya the tree is easier to establish than the Dadap. It can be grown from seed, but is usually propagated from

[1] This refers to introduction to the Experiment Station. *Erythrina velutina* was introduced into Ceylon from the West Indies in 1881.

six-feet cuttings. Three-feet cuttings have also been successfully employed in the New Avenue rubber to form a low cover. During the last four years, a very large number of cuttings has been supplied to estates, particularly in the Uva districts.

Leucæna glauca.

This tree is fully described in Leaflet No. 7. It can be seen in plots 140 G, 140 M, and plots E 85–E 96 as shade for coffee. Propagation from cuttings has not proved successful, but the tree is easily grown from seed and gives a light feathery shade. It seeds prolifically from an early age; the seedlings quickly get a firm hold and are hard to eradicate. The seed is a valuable food for cattle, and is now being used for this purpose on the Experiment Station.

Adhatoda Vasica.

This shrubby tree can be seen in Show Plot V. It is not leguminous, and does not seem likely to compare with Dadap or Gliricidia in rate of growth or weight of green material.

THE SHRUBBY FORMS.

Tephrosia candida.

This well-known plant, also known as Boga medeloa, can at present be seen in the Show Plots, the New Avenue rubber, and the Annual Economic area. The plant makes vigorous growth at Peradeniya, and attains a height of 8 feet or more. The following weights of green material are given in Royal Botanic Gardens Circulars, Vol. V., No. 17 —12·0, 12·68, 14·82, and 19·42 tons per cutting per acre, planting 1 foot apart in rows and cutting when 4 feet high four times per annum. The germination of seed is sometimes slow and unsatisfactory. The depredations of the caterpillars of *Maruca testulalis*, *Etiella zinckenella*, and *Lampides bochus* result in damage to a great deal of good seed.

Tephrosia Hookeriana.

This plant, which was imported from Sarawak,[1] can be seen in the Show Plots and in the Bandaratenne rubber. It is smaller and has a more woody growth than *Tephrosia*

[1] *Tephrosia Hookeriana* is indigenous to Ceylon.

candida, and from recent experience does not stand comparison with that plant. Germination of seed is not usually good. Yields of green material of 7 tons 17 cwt. and 4 tons 16 cwt. per acre per cutting have been obtained.

Tephrosia purpurea.

This plant which is so well known in the northern dry zone of Ceylon and in South India is not to be compared as a source of green material with *Tephrosia candida* or many other green manures grown on the station. It has a low spreading habit, has small leaves, and soon becomes very woody. It is, at Peradeniya, very difficult to grow from seed. A yield of 4 tons 1 cwt. per acre is quoted.

Crotalaria striata.

This plant can be seen in the Show Plots, and at present in many plots of the Economic collection. It has already been mentioned in connection with tea experiments. It makes an excellent cover at Peradeniya, and has given a yield of 14½ tons per acre in one cutting. Mr. J. A. Holmes stated that the plant would give up to four cuttings before dying out, but recent experience is to the effect that it will not generally stand anything more than a very light trimming.

Crotalaria usaramoensis.

This variety was introduced by Mr. M. Kelway Bamber from Java. It forms a magnificent cover at Peradeniya. Though figures are not available, it can be confidently stated that the yield is heavier than that of *Crotalaria striata*. It produces large quantities of minute yellow seed. It can at present be seen in many of the plots of the Economic collection and in the Bandaratenne rubber. A considerable quantity of seed has been recently sold to the public.

Crotalaria incana.

This variety is distinguished from the preceding two by its smaller habit and round leaf. It can be seen in the Bandaratenne rubber. A total yield per acre of 11 tons in two cuttings has been quoted, but the amount of leafy material is palpably less than can be obtained from *C. striata* or *C. usaramoensis*, and the growth less vigorous.

Indigofera arrecta.

Consequent upon the planting of both species in one area, and of confusion in the collection of seed, this variety has become mixed with *Indigofera suffruticosa*. The two plants are, however, very similar. *Indigofera arrecta* can be seen in the Show Plots, in the Bandaratenne rubber, and elsewhere. At Peradeniya it is an easier plant to establish than Tephrosia. Germination is always good, and the growth usually even and vigorous. It stands lopping better than the Crotalarias, but not so well as the Tephrosias. Experience with contour hedges of this plant in the Hillside tea has been described in Section I. The plant grows to a height of 6 feet or more, and seeds copiously and early. Actual yields of loppings are not to hand, but the yield is estimated to be inferior to *Tephrosia candida*, *Crotalaria striata*, or *C. usaramoensis*, but superior to any of the other plants so far described.

Indigofera hirsuta.

This plant was formerly grown on the station, and its cultivation has been recently resumed. It can be seen in the Show Plots. It has a more bushy and spreading habit than the *arrecta*, and the leaves are of a more glaucous green. It has a small pink flower. It is stated to have furnished a yield of 13 tons 18 cwt. per acre in one cutting, and would certainly appear to furnish more green material than *Indigofera arrecta*. Its growth after cutting is uncertain. It can be seen in the Show Plots.

Sesbania aculeata.

This is the plant so well known in India under the name of Daincha. The seed germinates very quickly and evenly. As mentioned, it is perhaps the most successful green manure for wet paddy fields. The growth is erect and sparse. As a yielder of green material it has very little value at Peradeniya. It can be seen in the Show Plots and in the Bandaratenne rubber.

Cassia hirsuta.

This is a bushy plant which grows freely and produces a good deal of leafy growth when young. Later it becomes very woody. Its great disadvantage is that hardly any nodules appear to be formed. The plant can be seen in the Show Plots and in the Bandaratenne rubber.

Dhal.

Cajanus indicus.

This plant at present occupies a plot near the office. It has been successfully grown in the New Avenue and Bandaratenne rubber areas, but was found not to stand more than one lopping.

Clitoria cajanifolia.

This recent introduction from Java[1] can be seen in the Show Plots and in the Fruit Plots. It appears for certain purposes one of the most promising plants on the Experiment Station. It is an erect fairly bushy plant which thickens out well after cutting, and promises to supply a good weight of green material. As far as can be seen at present it stands continued lopping very well, even in dry weather. The seed germinates well and evenly, and the young plants appear remarkably resistent to drought. The stems become very woody and firmly rooted, but as a plant for contour hedges on steep land it shows great promise. Seed is freely produced. Young plants show a vigorous formation of nodules.

Creeping Plants.

The recent interest in the question of soil erosion has led to considerable attention being paid to this form of cover plant.

Centrosema Plumieri.

A Show Plot of this plant was established some five years ago or more, and the cover given is still excellent. It seeds, however, very sparsely, and is difficult and slow to establish. Some seed sown in the north-east end of plot 13 in June, 1922, was considered two months later to have practically failed, but has now (1½ year later) made a very fair start.

Centrosema pubescens.

This species is said to be preferred to *Centrosema Plumieri* in Java. A Show Plot was sown in November, 1923, and showed better and quicker germination and early growth

[1] *Clitoria cajanifolia* is an old introduction to Ceylon.

than *Centrosema Plumieri*. The plant puts out twining tendrils. It has already (February, 1924) flowered and set some seed. A block of the New Avenue rubber was sown simultaneously with the show plot; germination was fair, but in January, 1924, the seedlings had completely disappeared. A fresh growth, however, started later, and a very fair cover has since been formed.

Indigofera endecaphylla.

The first introduction of this plant, which has gained considerable popularity in South India, was made in November, 1921, when some cuttings were sent from Mooply Valley estate. The cuttings arrived in poor condition, however, and the first attempt ended in failure. Seed was obtained from the same source in April, 1923, and sown in a Show Plot. An excellent cover was soon formed, and a large quantity of seed set. The plant seems disposed to dieback during the dry weather, but comes on again with rain. It has a small pink flower. By early 1925 plenty of seed should be available. Two plots in the Economic collection were sown with this plant, but the growth is inferior to that in the Show Plots. The plant has now been most successfully propagated by bunches of 15-inch cuttings, buried in the middle, with the two ends sticking out.

Vigna oligosperma.

This plant was formerly known as *Dolichos Hosei*. A Show Plot was sown in March, 1923, with seed imported in March, 1923. An excellent thick cover was formed. During the north-east monsoon of 1923-24 several attempts were made to establish cuttings of this plant, but all failed.

The plant has been successfully propagated from bunches of cuttings as described above.

Pueraria javanica.

Seed of this plant was first sown in November, 1923. Germination was slow and poor, but subsequently a good cover was formed.

Desmodium triflorum.

This low-creeping clover-like plant forms a close carpet under suitable conditions. It can be seen interspersed with

Paspalum conjugatum in the grass paths in the Economic collection and elsewhere. It was found very successful as a soil wash preventer in the experiments described below. Where not naturally established the growth is not sufficiently vigorous to keep down other weeds.

Mikania scandens.

This is a non-leguminous creeper, which is very prevalent on the waste lands of this district. Its use for wash prevention has been discussed from time to time, and a small patch is at present planted under old rubber in plot 82.

OTHER PLANTS.

A considerable number of other green manure plants have been grown from time to time on the station, and notes on these will be found in the Circulars and Bulletins quoted in the Appendix.

SOIL EROSION.

In 1909 a series of experiments in the prevention of soil wash was carried out in the steep portion of the Bandaratenne coconuts. Uncontrollable factors prevented any great reliance being placed upon the following results:—

Approximate Loss of Soil in Tons per Acre.

	Tons.
Bare soil weeded monthly	115
Dadaps	106
Bare soil deep forked	79
Albizzias	67
Ipomæa	45
Crotalaria incana across slope ..	43½
Crotalaria and Indigofera, 1 foot apart up slope	26½
Crotalaria across slope, 1 foot apart in rows ..	26½
Desmodium triflorum	12½

The rainfall during the period of experiment was 59 inches.

ANALYSES.

The result of some analyses carried out from time to time by the Government Agricultural Chemist are set out in the following table :—

Sun dried Samples.	Dadap Loppings.	Glirecidia Loppings.	Albizzia Loppings.	*Leucæna glauca* Loppings.	*Acacia decurrens* Loppings.	*Cajanus indicus* (Dhal) Whole Plant.	*Tephrosia candida* (Boga medeloa).	*Tephrosia Hookeriana* (Whole Plant).	*Tephrosia purpurea.*	*Tephrosia villosa.*	*Crotalaria striata.*	*Crotalaria juncea* (Sunn Hemp).	*Vigna Catiang* (Cow Pea).	*Phaseolus lunatus.*	*Indigofera amil.*	Desmodium Species.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Moisture	8·75	8·50	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Organic matter	82·40	82·65	—	—	—	—	82·84	84·81	—	—	—	—	—	—	—	—
Ash	8·85	8·85	5·60	5·52	5·53	—	5·16	4·42	—	—	6·62	—	14·16	7·70	—	—
Total	100·00	100·00	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Containing nitrogen	3·09	1·79	1·13	2·57	2·16	1·60	2·80	2·41	2·13	2·72	3·80	3·75	3·88	2·98	1·68	2·90
Analysis of Ash.																
Lime	1·88	2·41	1·26	1·82	3·45	—	1·03	1·10	—	—	1·05	1·20	3·40	1·72	—	—
Potash	2·62	2·53	1·16	1·38	·80	—	1·63	1·27	—	—	2·35	2·43	3·45	2·70	—	—
Phosphoric acid	·70	·29	·51	·31	·23	—	·37	·44	—	—	·77	1·54	·83	·72	—	—

SECTION 9.

THE ECONOMIC COLLECTION.

This area comprises 103 plots of 1/10 acre each. The plots are numbered E 85 to E 188. A small label indicating the number is found in the corner of every plot.

The area lies at the south-east corner of the station.

The land was formerly under cacao and coconuts. The laying out of the plots in their present form was completed in 1920, and the planting of the permanent Economic Products was commenced in 1921. The collection is intended to form—

(1) A source of supply of seed or other planting material.
(2) A means of obtaining some information as to the growth, local suitability, yields, &c., of the crops planted.
(3) A demonstration.

The area is wind swept; the soil is naturally poor, and considerable difficulty has been experienced in establishing many of the crops.

In the following list only the crops actually planted at the time of writing are given. The remaining plots are either under green manures, or are utilized from time to time for the growth of annual crops:—

Plots E 85 to E 96.—Coffees. Shade: *Leucæna glauca.*

E 85.	Robusta	Robusta types.
E 86.	Canephora	
E 87.	Uganda	
E 88.	Quillou	
E 89.	Hybrid	
E 90.	Arabica	
E 92.	Maragopipe	Liberian types.
E 94.	Abeokuta	
E 95.	Excelsa	
E 96.	Liberia Pasir Pogor	

Plots E 97 to E 108.—Teas. Shade: *Gliricidia maculata.*

Planted 15 feet by 15 feet for seed bearers.

E 97. China tea.
E 98. Assam indigenous (Indian seed).
E 99. Dark leaf Manipuri from Kanapediwatte estate.
E 100. Dark leaf Manipuri from Mousakande estate.
E 102. Dark leaf Manipuri from Chapelton estate.

Plots E 109 to E 120.—Cacaos.

E 112. Ceylon Criollo.
E 113. " Poerbojo " cacao from Java.
E 114. Nicaraguan Criollo Type A.
E 115. Nicaraguan Criollo Type B.
E 116. Nicaraguan Criollo Type C.
E 118. Forastero cacao from Kondesalle estate.

Plots 121 to 126.—These plots were originally also allotted or cacao, but are now to be planted up as a wind break.

Plots 127 to 138.—Spices.

E 127. Nutmeg (*Myristica fragrans*).
E 128. Clove (*Eugenia caryophyllata*).
E 129. Pimento (*Pimenta officinalis*).
E 131. Cinnamon (*Cinnamomum zeylanicum*).
E 133. Betel (*Piper Belle*).
E 134. Vanilla (*Vanilla planifolia*).
E 135. Cardamoms (*Elettaria Cardamomum*).
E 138. Common pepper (*Piper nigrum*).

Plots E 139 to E 144.—Rubbers.

E 139. African rubber (*Funtumia elastica*).
E 140. Ceara rubber (*Manihot Glaziovii*).
E 141. Castilloa rubber (*Castilloa elastica*).
E 142. *Manihot dichotoma.*
E 143. *Ficus Vogelii.*
E 144. (Vacant).

Plots E 145 to E 150.—These plots were formerly intended for gutta producing plants, but are now to be planted up as a wind belt.

Plots E 151 to E 156.—Citrus Fruits.

E 151. North-western end ; country limes (*Citrus aurantifolia*).
E 151. South-eastern end ; British Guiana limes.
E 152. North-western end ; lemons (Crinkled rind) (*Citrus limonia*).
E 152. South-eastern end ; grape fruit (*Citrus grandis*).
E 153. Sweet oranges (*Citrus aurantium*).
E 154. Pumelos (*Citrus maxima*).
E 155. Mandarin oranges (*Citrus nobilis*).

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Plots E 157 to E 168.—Drugs.

E 159. *Erythroxylon Coca.*
E 160. *Cola acuminata.*
E 161. *Croton Tiglium.*
E 162. *Jatropha gossypifolia.*
E 164. Indian Sarsaparilla (*Hemisdesmus indicus*).
E 165. Nux Vomica (*Strychnos Nux-vomica*).
E 166. Ipecacuanha (*Psychotria Ipecacuanha*).
E 167. Medicinal aloes (*Aloe vera*).
E 168. *Quassia amara.*

Plots E 169 to E 174.—Dyes.

E 169. Annatto (*Bixa Orellana*).
E 170. Logwood (*Hæmatoxylon campechianum.*)
E 171. Sappan (*Cæsalpinia Sappan*).
E 172. Sandalwood (*Santalum album*).

Plots E 175 to E 178.—Tans.

E 175. Divi divi (*Cæsalpinia coriaria*).
E 177. *Cassia auriculata.*

Plots E 179 to E 186.—Fibres.

E 179. Manila hemp (*Musa textilis*).
E 181. Mauritius hemp (*Furcrea gigantea*).
E 182. Bow string hemp (*Sanseviera zeylanica*).
E 185. Sisal hemp (*Agava rigida*).
E 186. China grass (*Boehmeria nivea*).

Plots E 187 and 188 (two corner plots).—Oil-yielding Grasses

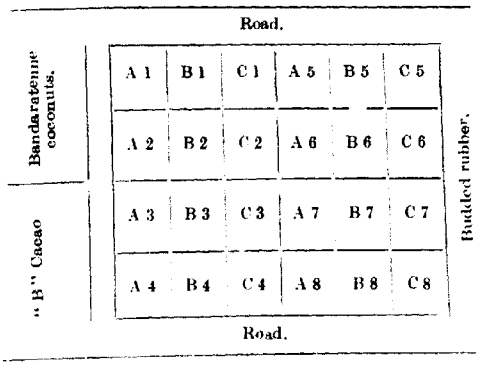
Plot E 187 { (*a*) *Cymbopogon Nardus.* (*b*) *Cymbopogon Winterianus.* (*c*) *Cymbopogon citratus.*
Plot E 188 { (*a*) *Cymbopogon Nardus.* (*b*) *Cymbopogon polyneuros.* (*c*) *Cymbopogon confertiflorus.*

SECTION 10.

THE ANNUAL ECONOMIC AREA.

In 1911 this area was under old cacao. It was cleared in 1916 and utilized as students' plots, while a strip on the north-west side, adjoining plot 20, was planted in sugar cane in January, 1920. The remainder of the area, in June,

1921, was under hill paddy. Early in 1922 all the sugar cane was cut out ; a vast quantity of illuk forked out ; and a road, which formerly ran through the western corner of the area, was filled up, and the present road dug to take its place. In March of the same year the present plots were laid out according to the plan shown below.



The area is intende ' for trials of all annual economic crops. A three-course rotation of cereals, tubers, legumes is in general maintained, though modifications may be made to suit the needs of the moment.

Each plot is ¼ acre. The plots A 5, 6, 7, and 8 are intended for duplicates of A 1, 2, 3, and 4. The B and C plots are similarly duplicated. Thus all the A plots will be in one year under one course of the rotation, the B plots under another course, and the C plots under the third.

As might be expected, owing to the different early treatment the different portions of the area had received, the first crops were very patchy. The soil at the whole of this end of the station is poor. Good crops of maize and Adlay have been grown, but other results have so far been poor. The best recorded results are yield of 1,376 lb. or 27½ bushels of Brazos White Corn, and a yield of 2,484 lb. or 69 bushels of Adlay grain and 22,060 lb of straw. The land is showing signs of improvement under uniform cultivation and manuring, and the prospects for 1924 crops are more promising. Kalutara snails have always given great trouble in this area, and in 1923-24 trials have been carried out to ascertain whether the maintaining of a barrier of ashes or sand and copper sulphate is an economic possibility on a field scale.

SECTION 11.

FRUIT.

Three acres were cleared of old coconuts in 1910 and planted up to form the present fruit plots. English and other vegetables have been periodically interplanted as catch crops. Beetroots, carrots, lettuce, tomatoes, celery, cucumber, in addition to all the locally grown vegetables, have been successfully grown. Pineapples are planted round the edges of the paths and over a portion of F 16; the varieties planted are the Mauritius, the Kew or smooth Cayenne, and a small patch of Ripley Queen. Fair success has been obtained with pineapples, and a large number of suckers have been sold from time to time. It is hoped in 1924 to establish a larger area of pineapples. Plantains were also grown as a catch crop while the fruit trees were young. Three methods of planting plantains were tried :—

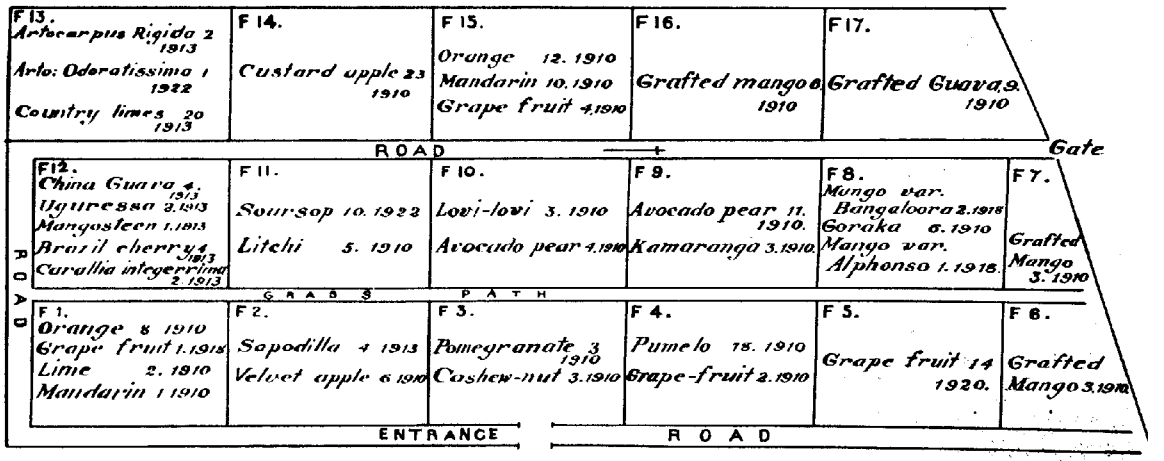
(1) The West Indian method of burying the suckers in a hole 2 feet deep with the eye uppermost.
(2) The local method of cutting the sucker in half and planting upright.
(3) The local method of planting the whole sucker.

The West Indian method gave the best growth and earlier fruiting. Trials in the tapping of papaw for papain were carried out in 1915. The papaws were planted 6 feet by 6 feet between the rows of fruit trees. Rapid growth was made, and the trees fruited twelve months after planting. The results were as follows :—

No. of Trees.	Variety.	No. of Tappings.	Interval.	No. of Fruits tapped per Month.	Yield Dry Papain per Tree.	Yield per Acre of 1,210 Trees.	Period in which obtained.
					oz.	lb	Months
	Long fruit	34	Every eighth day	1,460	2·38	157	9
	Round fruit	34	do.	1,226	2·08	157	9
	Long fruit	52	Every fifth day	1,682	2·25	170	8
	Do.	35	Once a week	1,003	1·41	106	9

A yield of 3·88 oz. per tree or 292 lb. per acre was obtained from a mixed lot of 204 trees in another part of the station.

PLAN 6
PLAN OF FRUIT PLOTS



The papain was sold at Rs 3·50 per lb.

The arrangement of the permanent fruit trees will be found in plan 6. In each plot the kind of tree, the number of trees, and the year in which planted is shown. The plots are also fully labelled. Vacant spaces are utilized for trial of new plants, &c.

In plots F 1 and F 15 there appears to have been a mixture of seed at the original planting. F 1 was intended for oranges and F 15 for mandarins, but a mixture is found in both plots. F 13 was planted originally with lemons, these were always sickly and trees died out periodically; the survivors were uprooted in 1923 and replaced by country limes. A number of Columbian Pita plants are at present on trial in plots F 8 and F 17. The health of the Citrus fruits, with the exception of Pumelos and Grape fruit, is not satisfactory. Pink disease and other fungoid diseases are common. The Litchi trees in F 11 have never fruited, and the fruiting of mangoes has not been satisfactory owing to the unfavourable climatic conditions which prevail at Peradeniya at the time of flowering.

Further reference to plantains with reference to the "Bunchy top" disease will be found in Section 13.

SECTION 12.

SUGAR CANE.

Within recent years a number of varieties of sugar cane have been introduced from the West Indies, Mauritius, and elsewhere, with the object of studying their yields and local suitability, so that some information and planting material be available, should an industry materialize.

Analyses of these canes made by the Government Agricultural Chemist have shown the juices of the canes to be generally up to the average for tropical countries. The yields given below have been obtained in plots 19 and 20 and in part of the present Annual Economic area. At the present time most of the varieties mentioned can be seen in the Annual Economic area and in plot 17. The only disease which has appeared to any marked extent in recent years has been "Collar rot."

The variety known as "Sin Nombre" appears practically immune from this, while 55 P, Sealy's Seedling, and 131 P have been worst affected. An experiment in germination of sets of 16 months' old canes and over appeared to show that above this age the older the canes the worse the germination of the sets. The following table gives recent sugar cane yields :—

Calculated Yields in Tons per Acre.

Variety.	First Crop,* 1920–21. Annual Economic Area.	First Crop, 1921–22. Plots 19 and 20.	First Ratoon Crop, 1921–22. Annual Economic Area.	First Ratoon Crop, 1922–23. Plots 19 and 20.	Second Ratoon Crop.
1,237	37·8	21·7	17·0	22·4	16·4
55 P	35·4	15·7	17·8	23·3	16·5
Sealy's Seedling	45·8	18·2	17·6	—	—
131 P	20·8	12·0	18·2	25·0	16·9
D. K. 74	21·8	42·7	18·3	25·0	—
3,390	27·6	22·4	18·1	20·1	—
Striped Tanna	—	30·5	8·1	16·4	—
Striped White Tanna	14·1	20·1	7·3	—	—
Barbados 208	—	13·8	—	4·1	—
Red Top Mauritius	—	32·1	—	28·9	—
Sin Nombre	—	38·9	—	44·8	—

* These yields were calculated from small areas and are not very reliable.

SECTION 13.

MISCELLANEOUS PLOTS.

Plot 16.—The north-eastern end of this plot is under Vanilla, with *Plumeria acutifolia*, the Temple tree, as support. This vanilla is believed to have been first planted on Dadap supports. An undated record (probably 1913) states that the Dadaps were thinned and temple tree stumps planted. Some of the Dadaps were subsequently cut out, and the last

were removed in September, 1921. The date of the planting of the vanilla is uncertain, but the first flowers appeared in April, 1914. This vanilla has not borne satisfactorily for a number of years. A fresh plot from cuttings of this plot has been established on Plumeria supports in the Economic collection.

The centre portion of the plot was in July, 1921, handed over to the Mycological division for experiment with "Bunchy top" of plantains. The land had at one time been under Manila hemp which had died out from a disease resembling "Bunchy top." Plantain suckers were planted in July, 1921, and various manures, particularly potash manures, were subsequently applied. No results have as yet been published. The south-western end of the plot was under sugar cane in January, 1921; the canes were cut out in that month, and the land put under maize in August of that year. Ceylon yams were then cultivated till November, 1923, when one row each of ten varieties of plantains were planted. An experiment with regard to bunchy top prevention was inaugurated at the same time the area was divided into three blocks running at right angles from the road. The block nearest the rubber was treated with a mixture consisting of 50 per cent. lime and 50 per cent. concentrated superphosphate at the rate of 10 cwt. per acre, and the suckers were dusted with this mixture before planting. The next block was treated with the same quantity of the same mixture with the addition of sulphur at the rate of 5 cwt. per acre. The suckers were also dusted with the manurial mixture. In the third block the suckers were dusted with the manurial mixture, but no further treatment given. As the suckers were of varying sizes all were cut down to the ground in January, 1924, in order to give them an even start. It is still too early to identify symptoms of bunchy top.

Plot 17.—This plot has of late years borne miscellaneous crops of sisal and Mauritius hemp, China grass, cassava, lucerne, &c. At present the north-eastern end is planted with Dadap cuttings, with a view to establishing a fresh plot of Vanilla with these trees as supports. The south-western end is under sugar cane, while the centre is vacant.

Plot 18.—This plot has also been used for miscellaneous purposes. In 1921 and 1922 a considerable part of the plot formed a sisal nursery, from which a large number of young plants were sold. At present the north-eastern end is planted with Dioscorea yams.

Plots 19 and 20.—These two plots were under sugar cane from 1920 till 1924 (see Section 12). The present intention is to plant as one plot with pineapples in 1924.

Plot 24.—This plot was planted in camphor in 1906. In March, 1921, the price of camphor being high, experiments in distillation of leaves and twigs were commenced. The first plant used consisted of a boiler, a wooden still, and three wooden condensing boxes of the pattern used in Formosa. The chief drawback to this plant was that the boiler gave too high a pressure to enable a sufficiently slow flow of steam to be passed through the leaves and twigs in the still.

In spite of various modifications in procedure a satisfactory outturn of camphor was not obtained. In September, 1921, a large copper retort, into which both water and leaves and twigs were put, was substituted for the boiler and still.

An improvement resulted, but the highest percentage of camphor obtained was 0·60 per cent. of the fresh leaves and twigs. Subsequent trials with air-dried leaves and twigs gave an outturn of 0·91 per cent., and this was believed to compare not unfavourably with results obtained in other countries with leaves and twigs. The whole plant was of a makeshift nature, and admitted of considerable improvement if time, attention, and funds had been available. Trials with a large chatty as a retort invariably ended in the cracking of the chatty. Old leaves alone, without twigs, yielded 1·08 per cent. of camphor. A small quantity of camphor oil was also produced in all these distillations. Distillations of camphor wood chips gave a little oil, but no camphor crystals. Camphor was sold to Messrs. Miller & Co. at Rs. 3·25 per lb., at which price it was estimated that, even with a 0·60 per cent. outturn on the fresh material, distillation was profitable.

Plot 25.—This plot for at least five years has been abandoned to a growth of illuk. Labour to fork out the illuk not having been available during this period, the following methods of combatting the weed have been tried :—

(1) Dragging out with a Planet junior cultivator drawn by an elephant.

(2) Planting cuttings of *Mikania scandens*.

(3) Planting cuttings of "Sun flower cheddy (*Tithonia diversifolia*)."

(4) Planting manioc cuttings, 1 foot apart.

(5) Cutting the illuk and broadcasting with mustard.

(6) Close planting with Ceara rubber cuttings in alavango holes.

(7) Cutting the illuk and forming a close thatch with the cut grass.

In (1) to (5) the illuk has proved victorious; (6) and (7) are still in progress ; (7) appears to be proving successful.

Plot 140 C.—This plot is planted with *Erythroxylon Coca* the source of the drug cocaine.

SECTION 14.

GENERAL.

Sweet Potatoes, Cassava, and Dioscorea Yams.

Fairly extensive trials with a considerable number of varieties of these crops, both local and imported, have been in progress during the last four years. Owing to the large number of varieties involved and the necessity of reducing error by frequent repetition, the time required to bring the trials to a satisfactory conclusion is lengthy. It is not proposed to publish results until at least five reliable yields from each variety are available.

Labour.

The labour force of the station consists partly of resident Tamils and Sinhalese, and partly of Sinhalese from the neighbouring villages of Gannoruwa and Yatiyalagala.

At the present time there are (including village labour) 180 names on the check roll which, with an outturn of 80 per cent., gives a daily working force of 144 coolies.

Disposal of Produce.

Rubber and cacao are sold in the Colombo market. Tea leaf is manufactured by New Peradeniya estate and sold in Colombo. Coconuts and all other miscellaneous produce are disposed off at auction sales held every two months at the Experiment Station.

Vote and Revenue.

The annual vote for labour and upkeep of the Experiment Station is at present Rs. 30,000, exclusive of the salaries of the monthly paid members of the staff. The revenue for 1922–23 was Rs. 25,171·44, the highest on record ; of this sum, Rs. 10,404·73 was realized from tea.

APPENDIX.

List of Departmental Publications dealing with Work on the Experiment Station.

CACAO.

Circulars, R. B. G., Vol. II., Circular 21.—Cacao Canker and Spraying in Ceylon. Herbert Wright ; September, 1904.

Circulars, R. B. G., Vol. II., Circular No. 24.—On the Varieties of Cacao at the Experiment Station. R. H. Lock ; October, 1904.

Circulars, R. B. G., Vol. III., Circular No. 3.—The Chemical and Physical Properties of Soils from the Cacao Plots. A. Bruce ; July, 1905.

Circulars, R. B. G., Vol. VI., Circular No. 4.—Report on Manurial Experiments with Cacao. R. H. Lock ; October, 1911.

Circulars, R. B. G., Vol. VI., Circular No. 9.—On the Effect of Shade in Cacao Cultivation. R. H. Lock ; May, 1912.

Bulletin No. 5.—Cacao : Manuring and Shading. R. N. Lyne and D. S. Corlett ; July, 1913.

Bulletin No. 14.—Manuring of Cacao at Peradeniya. M. Kelway Bamber and D. S. Corlett ; December, 1914.

Bulletin No. 26. Experiments in Manuring of Cacao. M. Kelway Bamber and D. S. Corlett ; September, 1916.

TEA.

Circulars, R. B. G., Vol. III., Circular No. 2.—The Chemical and Physical Properties of the Soils from the Tea Plots. A Bruce ; May, 1905.

Circulars, R. B. G., Vol. V., Circular No. 1.—The Tea Plots at the Experiment Station. M. Kelway Bamber ; March, 1910.

Circulars, R. B. G., Vol. V., Circular No. 15.—Experimental Tea Plots, Peradeniya. M. Kelway Bamber and J. A. Holmes ; April, 1911.

Bulletin No. 9.—Tea : Green Manuring at the Experiment Station, Peradeniya. M. Kelway Bamber ; May, 1914.

Bulletin No. 37.—Results of Tea Experiments, Experiment Station, Peradeniya, 1914-17. M. Kelway Bamber ; July, 1918.

RUBBER.

Circulars, R. B. G., Vol. V., Circular No. 19.—Results of Rubber Tapping during 1910–11. M. Kelway Bamber and J. A. Holmes ; June, 1911.

Bulletin No. 12.—Hevea Tapping Results, Experiment Station, Peradeniya, 1911–13. T. Petch ; August, 1914.

Bulletin No. 17.—Hevea Tapping Results, Experiment Station, Peradeniya. T. Petch ; April, 1915.

Bulletin No. 18.—Rubber Manuring Experiments at the Experiment Station, Peradeniya. M. Kelway Bamber ; May, 1915.

Bulletin No. 25.—Hevea Tapping Results, Experiment Station, Peradeniya, 1915. T. Petch ; August, 1916.

Bulletin No. 34.—Hevea Tapping Results, Experiment Station, Peradeniya, 1916. T. Petch ; September, 1917.

Bulletin No. 36.—Rubber Manuring Experiments, Experiment Station, Peradeniya, 1915–17. M. Kelway Bamber ; June, 1918.

Bulletin No. 42.—The Effect of Time Intervals in Rubber Tapping. T. Petch ; January, 1919.

Bulletin No. 47.—"Change-over" Tapping. T. Petch ; March, 1920.

COCONUTS.

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